PORT OF LOS ANGELES
CHANNEL DEEPENING PROJECT
CONTAMINATED SEDIMENT MANAGEMENT PLAN

May, 2009

Addendum 2

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

1.0 Executive Summary

The US Army Corps of Engineers (USACE) is currently underway with the implementation of the Port of Los Angeles Channel Deepening Project. The USACE has produced a feasibility study titled, "Port of Los Angeles Channel Deepening Project, Feasibility Study, Main Report & Appendices" dated November 2000, that outlines and documents the project. The overall goal of the project is to deepen the navigation channels and turning basins from the existing federal channel depth of -45 ft, Mean Lower Low Water (MLLW) to a depth of -53 ft MLLW + 2 ft of overdredge. In addition, some berths and areas of the channel will be deepened. The construction contractor has completed placement of approximately 12,700,000 CY of dredge material in all of the approved project disposal areas. An additional disposal capacity of about 3,000,000 CY is needed to complete the Main Channel Deepening Project. A draft Supplemental Environmental Impact Statement/Supplemental Environmental Impact report (SEIS/SEIR) was released for public comment July 2008. The SEIS/SEIR documents the purpose and need for the proposed additional disposal project.

This Addendum 2 to the Contaminated Sediment Management Plan of January 23, 2002 (ref. 1) addresses the removal and placement of remaining contaminated dredge materials that are to be dredged as part of the proposed project modifications addressed in the SEIS/SEIR. Materials from the Main Channel Deepening Project, specifically the contaminated materials, are to be disposed of in the former Southwest Marine Shipyard (Berth 243-245). The plan has been developed in accordance with the goals of the Long Term Management Strategy defined by the Los Angeles Regional Contaminated Sediments Task Force (CSTF) which is lead by the California Coastal Commission (CCC) and the Los Angeles Regional Water Quality Control Board (LARWQCB). The Long Term Management Strategy established a goal of 100 percent beneficial reuse of contaminated dredge materials.

The main conclusions for the study are summarized as follows:

- A total quantity of 170,000 CY of contaminated sediment will be dredged under the Channel Deepening Project. This material has been determined to be unsuitable for open water ocean disposal.
- The contaminated material will be placed inside a 7.14 acre (measured at top of dike slope + 11 ft MLLW) Confined Disposal Facility (CDF), located inside the former Southwest Marine Shipyard (Berth 243-245).
- The Port of Los Angeles will implement the Berth 243-245 Expansion Project concurrently with the Main Channel Deepening Project.

2.0 Introduction/Purpose

The scope of this task is to provide an Addendum 2 to the 2002 Contaminated Sediment Management Plan (Ref.1 / Appendix A) and Addendum 1 (Ref.2, Appendix A) for the handling of contaminated material being dredged as part of the modifications proposed for the Channel Deepening Project. A final Supplemental Environmental Impact Statement/Supplemental Environmental Impact report (SEIS/SEIR) was released April 2009. The SEIS/SEIR documents the purpose and need for the proposed additional disposal project.

Contaminants have been identified in sediments within the Main Channel as well as in berths that remain to be dredged in the vicinity of Berths 127-131 and Berths 136-140 (Kinnetic Labs & Fugro, 2007). In addition, the slips at Berths 243-245 contain contaminated sediments from past shipyard operations (Weston, 2005). It should be noted that the levels of contaminants in these sediments are well below State of California Title 22 Total Threshold Limit Concentrations (TTLC), and are therefore not considered a hazardous waste under state or federal regulatory standards (Kinnetic Labs & Fugro, 2007). However, the presence of these contaminants makes these sediments unsuitable for open water disposal.

The Los Angeles Regional Contaminated Sediments Task Force (CSTF), which is led by the California Coastal Commission (CCC) and Los Angeles Regional Water Quality Control Board (LARWQCB), was formed to create a long term strategy for managing contaminated sediments within Los Angeles County, as authorized by California Senate Bill (SB) 673. Over a seven-year period, the CSTF developed the Los Angeles Contaminated Sediment Long Term Management Strategy (Anchor, Everest, and AMEC, 2005). The Long Term Management Strategy established a goal of 100 percent beneficial reuse of contaminated dredged materials. This goal complies with the requirements of the Clean Water Act (CWA) and Marine Protection, Research and Sanctuaries Act (MPRSA) to maximize beneficial reuse of dredged materials and minimizing discharges of dredged materials to the aquatic or ocean environment. The Los Angeles Contaminated Sediment Long Term Management Strategy identifies ocean disposal as a last option for disposal of contaminated sediments after beneficial reuse of the material "as is" (i.e. untreated) at a port fill site, treatment of the material for beneficial reuse, or some other direct beneficial reuse of the material have been evaluated or attempted (Anchor, Everest, and AMEC, 2005). However, because EPA prohibits ocean disposal of contaminated sediments, the Proposed Action does not include ocean disposal as an option for contaminated sediments.

The scope of work performed includes the qualification and quantification of contaminated material, development of preliminary dredge and disposal plans in compliance with the Long term Management Strategy, definition of design

criteria for the confined disposal facility, and the preparation of plans for the dredge and disposal areas.

Addendum 1 (ref. 7) to the 2002 Contaminated Sediment Management Plan addressed the removal of B 44-60 product and placement of this material into the Southwest Slip West Fill.

3.0 General Dredge and Disposal Plan

The conclusions made in the Supplemental Environmental Impact Statement/Environmental Impact Report (SEIR/SEIS) on the distribution of dredge materials have served as the basis for the preparation of this Contaminated Sediment Management Plan.

One objective in the development of the dredge plan, and of the Contaminated Sediment Management Plan has been to optimize the beneficial use of material that becomes available from the channel deepening in accordance with the Long Term Management Strategy of the CSTF. The disposal sites developed for dredge material from the approved Channel Deepening Project are inadequate for the total volume of sediments that require removal from the Main Channel and berths. Thus, the remaining dredge material required to complete the Channel Deepening Project presents an opportunity for using the dredge material as construction material that can be used for port development and/or environmental enhancement. Figure 1 shows the locations of remaining dredging required to complete the Channel Deepening project. The alternative to using this material for construction would be to transport it to the approved EPA ocean disposal sites located at LA-2 and/or LA-3. The additional disposal capacity needed to complete the Channel Deepening Project is estimated to be approximately 3.0 million cubic yards (CY), based on the January 2006 construction status. Of the approximate 3.0 million CY, a total of approximately 170,000 CY is considered to be contaminated because it is unsuitable for open water ocean disposal.

Five disposal areas were identified in the SEIS/SEIR. These disposal areas are:

- Disposal Options Associated with Port Development
  - Berth 243-245 Slip Fill
  - Northwest Slip Fill
- Disposal Option Associated with Environmental Mitigation and Enhancements
  - Cabrillo Shallow Water Habitat Expansion (CSWHE)
- Other Options
  - Ocean Disposal at LA-2 Offshore Disposal Site
  - Upland Disposal Site, Anchorage Road Soil Storage Site

Berth 243-245 Expansion

The Berth 243-245 slip is located on the former Southwest Marine (SWM) Shipyard. The SWM leased property in the POLA since 1981 for the operation of a ship repair, retrofit, and demolition business. Prior to 1981, the property was occupied by Southwest Shipbuilding Company (1918-1921) and Bethlehem Shipbuilding Corporations, Ltd. (1921-1981). Since the bottom materials of these berths are likely to be contaminated from these past operations, this site is proposed to be used as a Contaminated Disposal Facility (CDF) for sediments that are unsuitable for open water disposal. Although this area could potentially be used for a wide range of uses, the reasonably foreseeable use of the area is for future relocation of fishing industry activity currently located at Fish Harbor. This relocation is expected to improve efficiencies in operations of the fishing industry and associated re-handling and truck traffic. Planning and decision-making on the future use and development of the Berth 243-245, including the new landfill created by Channel Deepening material disposal (Figure 2), will include impact analysis and coordination in accordance with NEPA and CEQA guidelines.

The neat fill capacity of the Berth 243-245 disposal site is 458,000 CY. An estimated 90,000 CY will be dredged for a foundation trench needed for dike construction. This material will also be placed (side-cast) within the Berth 243-245 disposal site which leaves about 368,000 CY available for Channel Deepening material.

Northwest Slip Fill

There is an immediate need to improve the wharf roadway configuration at Berth 136-139 of the Trapac Terminal at the Northwest Slip. The current configuration requires trucks and other container movement equipment to make a 180-degree turn to exit the wharf area, which contributes to safety concerns as well as traffic and truck maneuvering delays. Construction of a landfill at the Northwest Slip would allow realignment of the wharf roadway which would facilitate safer and more efficient truck and equipment movement as shown in Figure 3.

The total capacity at the Northwest Slip disposal site is 128,000 CY. Foundation trenching for dike construction would require the removal of 50,000 CY.

Cabrillo Shallow Water Habitat Expansion

Up to 50 acres of additional shallow water habitat would be created adjacent to the existing Cabrillo Shallow Water Habitat (CSWH) as shown in Figure 4. This site could be used to dispose up to approximately 1,700,000 CY of material from the Channel Deepening project. Fill material would be supported by a new submerged dike along the north side of the existing CSWH. Construction of the site would raise the existing sea bottom, which ranges between -40 ft to -51 ft MLLW, up to a new elevation of -15 ft MLLW, thus creating shallow water habitat.

The additional expansion of the CSWH would increase the value of habitat in the outer harbor area. The increased value would be credited towards the POLA mitigation bank and could be used to offset impacts of future landfill development projects.

Ocean Disposal

Another viable disposal option involves disposal of suitable material at the approved Ocean Dredged Material Disposal Sites located at LA-2 as shown in Figure 5. This disposal option allows for disposal of material, but does not result in any beneficial use of the material.

Disposal at both sites would be accomplished consistently with recently adopted EPA regulations for managing ocean dumping. The LA-2 site is located approximately 5.9 miles south-southwest of the entrance to Los Angeles Harbor on the outer continental shelf. The depth of this site ranges from approximately 360 to 1,115 ft MLLW. An annual dredge material disposal capacity is 1,000,000 CY at this site.

Upland Disposal at Anchorage Road Soil Storage Site (ARSSS)

The Anchorage Road Soil Storage Site (ARSSS) has limited capacity, but is proposed to be used for disposal of maintenance dredging material that is unsuitable for ocean disposal. The ARSSS disposal site has been previously used for minor amounts of this type of material. Sediments would be placed in barges and shipped to an offloading site at Shore Road. There the sediments would have to be removed from the barges by clamshell and placed into trucks for the short haul to the disposal site. This location is shown on Figure 6. An overview of the Port of Los Angeles, identifying the proposed Main Channel Dredge and Disposal areas is given in Figure 7.

4.0 Contaminated Material Dredge and Disposal Plan

4.1 Project Description and Objectives

The object of the Contaminated Sediment Management Plan is to develop the framework for handling and disposing of contaminated dredge material remaining from the Main Channel Deepening Project, and processing this material in a manner that meets both project and agency criteria related to handling and disposing of contaminated sediments.

4.2 Contaminated Material Dredge Areas

An evaluation of the levels of contamination in remaining dredge elements is shown in Table 4.1. A total of Five (5) contaminated dredge areas have been identified, distributed over seven (7) different dredge elements. These areas are shown in figure 8 and listed in below table:

Table 4.1 Contaminated Dredge Areas

Dredge Element	Location	Volume (1) CY
SWM	Southwest Marine Shipyard (Berth 243-245)	90,000
BD002-A	Yang Ming Terminal (Berth 125-131)	80,000
BD002-B		
BD003-B	Trapac Terminal (Berth 136-137)	
BD005	Yusen Terminal (Berth 212-215)	
BD006		
BD008-1	Evergreen Terminal (Berth 220-221)	
	Total Contaminated Sediment	170,000

(1) The above quantities are neat-line quantities and include overdepth but no tolerance yet on bulking

Sediment chemical and biological testing for locations involved in the Main Channel Deepening/West Basin Development projects have been conducted under the Port of Los Angeles 2006 Marine Exploration Program. Results of that study have been summarized by Kinnetic Laboratories Inc. and Fugro West, Inc. in Volumes I and II of the "Evaluation of Sediments, Port of Los Angeles 2006 Marine Exploration Program".

4.3 Contaminated Material Properties

The materials from the channel and berths are described below:

Dredge units were initially based on the interpreted stratigraphic conditions developed by Fugro West, Inc. which are presented in the Geotechnical Investigation, Channel Deepening Project, Port of Los Angeles, California, prepared by Fugro West, Inc. for USACE, January 2002. A recent report, prepared by Kinnetic Laboratories, Inc. and Fugro West, Inc., has supplemented previous results to include stratigraphic and environmental conditions for various berths and proposed disposal locations as part of the Port of Los Angeles 2006 Marine Exploration Program. As a result, the dredge elements defined in the original Main Channel Deepening Project have been updated as listed below:

Dredge Unit Designation	**Description**
BD001, BD003-A, BD003-C, BD007, BD008, BD009, BD010-1, BD010-2	Coarse Grained Sediments Predominant
BD004, BD006-2, BD006-3	Fine Grained Sediments Predominant
BD002-A, BD002-B, BD003-B, BD005, BD006-1, BD008-1	Contaminated Materials are Present

The updated locations of dredge elements are shown in Figure 12.

Summary of Chemical/Biological Testing Results for Project Sediments

Sediments within the proposed project have been characterized and the testing results have been reported in the report titled, "Environmental Evaluation of Sediments, Port of Los Angeles 2006 Marine Exploration Program, Volume II. Berth Deepening, Fill Sites, Cerritos Channel Widening, and Consolidated Slip Remediation" (Kinnetic Laboratories Inc./Fugro West, 2007". In addition, data have also been analyzed and characterized for sediment in the Southwest Marine Shipyard in a recent study (Draft Report, Chemical and Geotechnical Characterization of Sediments in the Vicinity of Southwest Marine, Port of Los Angeles, Weston Solutions, Inc., 2005).

Uncontaminated Areas

Except for dredge material units identified above that contain contaminated materials, all sediments tested were judged to be suitable for open water disposal and for use as fill material. The upper-layer, finer grained materials that were judged not to be contaminated are less desirable as fill, but could be used either for fill or disposed of at an approved open water site.

Elutriate chemistry and/or suspended phase bioassay results on these materials indicated that water quality impacts would not be expected during open water disposal, or from decant water from a confined landfill

disposal area assuming normal operating procedures and proper design of the disposal area to control suspended solids (turbidity). These conclusions (Kinnetic Laboratories/ToxScan 1997; 2001a) are based upon the fact that elutriate results compared to ambient water quality standards and/or toxicity results from suspended phase testing indicated that little to no dilutions would be required for discharge into harbor receiving waters.

Southwest Slip Surcharge

Approximately 815,000 CY of uncontaminated sand has been temporarily placed on the Southwest Slip Disposal Area 1 as surcharge. This coarse grained material requires removal and replacement in other dredge material disposal sites.

Geotechnical Properties for Design

A recent study by Weston Solutions, Inc. (Ref 5) identified the following:

Location Southwest Marine Shipyard (Berth 243-245)

The following geotechnical investigations have been made in the contaminated dredge material area of the Southwest Marine Shipyard (Berth 243-245) (refer to Figure 10):

- A total of 9 vibratory sediment cores of 6 to 11 ft were collected within the slips. In addition three piston cores or diver operated push cores were collected.
- A total of five vibratory sediment cores were also collected in the channel adjacent to the Berth 243-245 slip area. Core lengths ranged from 5 to 13 ft

The following main properties can be identified from the cores in the Berth 243-245 slip area:

Surface Sediment Composition

Surface sediment samples (0-2 ft) were analyzed for grain size, total solids, specific gravity, and total organic carbon (TOC). The areas sampled adjacent to the dry dock (SWM 4, 5, 6, 9, 11, and 12) had the greatest fine grain sediment composition, with an average of 54.89% of the sampled material being comprised of silt and clay

Subsurface Sediment Composition

Subsurface sediment samples (2-13 ft) were analyzed for grain size, total solids, specific gravity, and total organic carbon (TOC). The greatest percentage of coarse grain material (gravel and sand) were found at sampling stations adjacent to the dry docks (SWM 4, 5, 6, 9, 11, and 12), with an of about 88.31% coarse grain material. The greatest amount of fine grain material was found at those sampling locations under the dry docks (SWM 3, 3B, 7, 8, 10, and 13) with an average of 51.95% of the sampled material being comprised of silt and clay.

Bulking Properties:
The methods of handling of the contaminated materials are discussed in Section 5.1. During the previous phase of the channel deepening project the ratio of future fill to cut balance was observed at around 14%. Refer to the draft SEIS/SEIR (Ref 6).

4.4 Contaminated Material Dredging and Disposal

Actual choice of equipment will depend on the equipment availability of the dredging contractors. An assessment analysis was performed on equipment utilization. The outcome of the analysis is the following tentative equipment utilization:

Dredging Methods
The completion of the channel deepening would continue to use electric-powered hydraulic and clamshell dredges. The clamshell dredge would be used in proximity to berths and to remove sediment unsuitable for open water disposal. The hydraulic dredge would deepen the channel to within approximately 125 feet of pierhead line, with the exception of the berths that would be dredged to the new channel depth. Final dredging of the berths would be performed with a clamshell dredge. Both types of dredge equipment would operate 24 hours per day and seven days a week until dredging is completed.

Cutter Suction Dredge (CSD)
The CSD will transport the material either by pumping it direct from the dredge through pipelines to the disposal site, or alternatively it will pump the material into barges, which then will dispose the materials at the disposal location.

Clamshell Dredge
Typically the clamshell dredge will release the dredge material into a scow or hopper barge. This scow or barge then sails to the disposal site and bottom dumps the material.

Disposal Methods
Transportation by Barge or Scow
Typically sediments from the clamshell dredge would be placed in a barge, transported by a tugboat to the designated disposal area, then bottom-dumped into the site.

Transportation by Pipeline
The pipeline is open-ended. Water with dissolved material will typically have a concentration of 10 to 20 percent solids when fine grained materials are dredged and are continuously discharged at the disposal area through the pipeline. Once the material is pumped, the larger soil particles will settle first, and fine sediments will take a longer time to settle.

For the Berth 243-245 site, the initial work would involve demolition and removal of structures as needed. A clamshell dredge will construct a trench along the perimeter of the fill area to key in the dike foundation. The dike would be initially constructed to a depth of -12 feet MLLW to allow entrance by barges to fill the area. All clamshell dredge sediments would be bottom-dumped into the site. The dike would then be completed and the remaining sediments would be pumped into the site by pipeline from the hydraulic dredge or re-handled by clamshell into the disposal site.

Environmental Considerations Associated with Dredge and Disposal Methods

In relation to the dredge and disposal of contaminated soils there are two main environmental considerations:

- Re-suspension of contaminated sediment in the water column
- Solubility of chemical contaminants from the soils in the water

These events can happen during each of the following transportation modes (pending on type of equipment):

During dredging and disposal operations, a certain amount of sediments are re-suspended into the water column, and some contaminates can also be dissolved into the water phase. Therefore, water quality implications must be assessed in order to evaluate potential water column impacts.

CSD

1. At the cutter
2. At the disposal site, discharge of water

Clamshells

3. At the clamshell during excavation
4. During lifting of the clamshell
5. Overflow of barges
6. During bottom dumping

Each of these phenomena is related more or less to the equipment, water conditions (temperature, currents), type and quantity of chemical contamination, and soil type.

For an initial comparison between different dredges and re-suspension of sediments, use can be made of Technical Note, Guide to Selecting a Dredge for Minimizing Re-suspension or Sediment, EEDP-09-01, USACE, December 1986. (Additional refinements are discussed in Technical Notes DOER-E5 through E9, and are contained in the ADDAMS system of numerical models.)

Table from TN EEDP-09-1:

Dredge Type	Down Current Distance – Suspended Solids Concentrations, mg/l*		
	Within 100 ft	Within 200 ft	Within 400 ft
CSD	25-250	20-200	10-150
Clamshell – open bucket	150-900	100-600	75-350
Clamshell – closed bucket	50-300	40-210	25-100

*Suspended solids concentrations were adjusted for background concentrations

It can be observed that with normal operations the CSD results in lower re-suspension of sediments then use of a Clamshell dredge. For the Clamshell dredge with the closed bucket the re-suspension is comparable to the re-suspension of the CSD.

The CSD will not produce and re-suspension through transport through the dredge pipes, the materials are already suspended. However, during this transportation stage, the contaminants might dilute to the transport water.

The Clamshell operation is typically supported by a number of scows or split-hopper barges, which will transport the dredge material to the disposal site. When the material is placed inside these barges it is normal practice that the barges overflow, i.e. the water (inclusive of a percentage of re-suspended sediment) is allowed to flow over the weirs. This significantly increases the capacity of the barges. The other alternative is to prevent the barges from overflow. The re-suspended solids inside the water in the barge will then not be discharged in the channel at the dredge location. However, these would be discharged at the disposal site.

Typically the overflow will occur mainly when the sediment being dredged is primarily sandy material. This allows for higher accumulation of coarse-grained material in the hoppers with the small fine grained fractions of silt and clay overflowing from the hopper bins into the surface water.

At the disposal location the materials are either pumped in (CSD) or dumped from the bottom of the scows or barges.

When the material is pumped inside the disposal location, the concentration of solids will be in the order of 10 to 20% when fine grained materials are dredged. This material would then undergo settlement in the disposal location. The time given for the suspended solids to settle dictates the suspended solids concentration in the water outflow out of the disposal location. The decant water contains both soluble contaminants,

and those contaminants associated with the remaining suspended solids in the decant water.

It is obvious that the water used for transportation through the pipeline would always contain a certain percentage of suspended solids, the limit would have to be verified against allowable suspended solids concentrations in the effluent. The suspended solids would contain contaminants.

Re-suspension of sediments also occurs when material is dumped from barges. Bucket dredges remove sediment at nearly in-situ density and place it in the scow/barges for transportation to the disposal area. Each time material is dumped is a discrete discharge of material. The dredge material descends rapidly through the water column to the bottom, and only a small amount of the material remains suspended.

Water quality concerns with respect to this Channel Deepening/Berth 243-245 project are as follows:

- Will contaminants be released to the water column during the dredging and filling operations such as to violate water quality standards? (USEPA, 2000; LARQWCB, 1994)
- Will increases in suspended sediments cause undesirable effects to biological resources, or violate local water quality standards?

Water quality determinations are made using bulk sediment chemistry and/or elutriate chemical analysis of the sediments to determine if ambient water quality standards can be met, or what dilution requirements would be required in a mixing zone to meet these ambient water quality requirements. These results are further verified by the use of suspended sediment bioassays.

Water quality objectives that need to be met within the Port of Los Angeles are defined in EPA Water Quality Standards for the State of California (USEPA, 2000), supplemented by guidance from the State of California Ocean Plan.

In practice, the elutriate test results and the suspended sediment bioassay results are first reviewed to indicate whether water quality standards with respect to contaminants can be met directly by the elutriate water (4 parts/1 part sediment test), or if a dilution requirement might reasonably be met by the planned dredging and disposal operations so that these standards would be met during the planned operations.

Secondly, numerical modeling using the U.S. Army Engineer Waterways Experiment Station's Automated Dredging and Disposal Alternatives Management System (ADDAMS) can be used to estimate dilutions to be achieved during the given dredging and disposal operations. Predicted

water quality concentrations of contaminants of interest can then be obtained, along with predicted suspended sediment concentrations. These predicted values can then be compared to water quality standards and objectives.

The dredge methods selected for construction of the Confined Disposal Facility will be the following:

- Closed Bucket Clamshell Dredge – For contaminated sediments from dike foundation trench (key) of the dike in the Southwest Marine Shipyard (Berth 243-245) and for contaminated sediments located at various berths.
- Cutter Suction Dredge (CSD) – For placement of uncontaminated material to be used as a geotechnical sand layer or fill.

The dredge and disposal plan has been designed to maximize the sediment resources of the Port of Los Angeles by providing for the reuse of dredge materials where possible.

Disposal sites are of the following types at the locations specified below:

- Disposal into an area surrounded by a dike that will eventually be above the water surface and which may be used for future Port facilities. A cap of clean sediments would be placed over the contaminated dredge materials if contaminated materials are placed within this site. Placement of contaminated material will be by a bottom-dump barge. The dike would be initially constructed to a depth of -12 ft MLLW to accommodate the approximate 12 ft of water required for the barge draft.

One such landfill is planned for the former Southwest Marine Shipyard. The vacant Berth 243-245 slip is proposed to be used as a Confined Disposal Facility (CDF) for sediments that are unsuitable for open water disposal.

Uncontaminated coarse grained materials would be used to construct a geotechnical sand berm for the CDF at Berth 243-245 for added structural stability. Finer contaminated sediments will be placed in the Berth 243-245 Confined Disposal Facility (CDF). These contaminated sediments would be from the dike foundation trench dredging and other dredging required to deepen various berths in the Port. Placement of dredge material would be bottom dumped or re-handled from barges. Uncontaminated fine grained material from various berth dredging locations will provide the remainder of the fill material for the Berth 243-245 landfill. A 10 ft sand cap and a 2 ft gravel blanket will cover the fill material. An estimated 167,137 CY of surcharge from the Southwest Slip will be transported to the Berth 243-245 landfill to be used as surcharge.

A submerged aquatic disposal site will be built as an extension of the present Cabrillo Shallow Water Habitat in the Outer Harbor. This site would be permanent and would provide for additional shallow water habitat. Approximately 1,430,000 CY of fine-grain materials from berth or channel areas would be placed at this site. Approximately 270,000 CY of coarse-grain material of Southwest Slip surcharge will provide a layer of sediment cap for this site.

Remaining materials will be disposed at the LA-2 offshore disposal site.

The contaminated sediment management plan has now been formulated, along with a contaminated material disposal/reuse plan. Initial evaluations were made of the elutriate and suspended sediment bioassay data with respect to water quality effects for each sediment unit tested.

The specific evaluations of the available elutriate chemical results and of the suspended phase toxicity test results were discussed in detail in Section 4.4 above. In general, the conclusions are that from a water quality perspective of the dredging and disposal operations, adverse impacts would not be expected from disposal operations, or from decant water from a confined landfill assuming proper design and operation. This conclusion is based (Kinnetic Laboratories, Ref 2) on the fact that the elutriate extracts and/or suspended phase toxicity tests showed that little to no dilutions would be required to meet ambient water quality standards. This should be true for both the uncontaminated sediments to be dredged, and for the contaminated sediments to be dredged from both the Channel Deepening areas, as well as the sediments from the Berth 243-245 area. For the channel sediments, it would be expected that either clamshell or hydraulic dredging could be used to dredge, transport, and dispose of this material in the planned areas since no dilutions would be required to meet water quality standards.

The monitoring program defined in section 5.2 below would confirm operations compliance and identify if any operational restraints would be needed to control turbidity. For the contaminated sediments that must be dredged at the Berth 243-245 site, a clamshell dredge will be used because of the small volumes in very limited areas that need to be moved. These sediments will be placed or side-casted directly into the Berth 243-245 landfill area.

Suspended solids concentrations area verified against the environmental permit. From the initial Channel Deepening project the relevant conditions of the permit are as follows (these permit requirements are indicative only and need to be finalized):

Department of the Army Permit Summary

The permittee shall minimize the amount of water and dredged material in the disposal vessel that flows over the sides of such vessel by complying with the following best management practices:

1. *Flow back of dredged water shall be allowed only at the dredge site and not during transit to the disposal site*
2. *Allowable flow back of dredged water from the disposal vessel at the dredging site shall be free from solid dredged material*
3. *Flow back of dredged water for all material unsuitable for unconfined open water disposal shall be allowed for a maximum of 15 minutes (cumulative flow back time per barge) and must comply with the RWQCB's waste water discharge and receiving water monitoring program requirements*
4. *No flow back of dredged material shall be allowed at the dredging site and no flow back of either dredge water or dredge material shall be allowed during transit to the designated disposal site*
5. *Flow back of dredged water shall be allowed for a maximum of 90 minutes for all material suitable for unconfined ocean open water disposal (cumulative flow back time per barge) and must comply with the RWQCB's waste water discharge and receiving water program requirements*

California Regional Water Quality Control Board: Discharge requirements (subtract):

1. *The removal and placement of dredged/excavated material shall be managed such that the concentrations of toxic pollutants in the water column, sediments or biota shall not adversely affect beneficial use*
2. *Enclosed bay and estuarine communities and populations, including vertebrate, invertebrate and plant species, shall not be degraded as a result of the discharge of waste*
3. *The natural taste an odor of fish, shellfish or other enclosed bay and estuarine resources used for human consumption shall not be impaired as a result of the discharge of waste*
4. *Toxic pollutants shall not be discharged at levels that will bioaccumulate in aquatic resources to levels which are harmful to human health*
5. *There shall be no acute toxicity or chronic toxicity in ambient waters as a result of discharge of waste*
6. *Dredging, excavation or disposal of dredge spoils shall not cause any of the following conditions in receiving waters:*
    a) *The formation of sludge banks or deposits of waste origin that would adversely affect the composition of the bottom fauna and*

flora, interfere with the fish propagation or deleteriously affect their habitat, or adversely change the physical or chemical nature of the bottom

b) *Turbidity that would cause substantial visible contrast with the natural appearance of the water outside the immediate area of operation. This is interpreted as increase in turbidity that exceeds 20% of the background levels at control sites.*

c) *Discoloration outside the immediate area of operation*

d) *Visible material, including oil and grease, either floating on or suspended in the water or deposited on beaches, shores, or channel structures outside the immediate area of operation*

e) *Objectionable odors emanating from the water surface*

f) *Depression of dissolved oxygen concentrations below 5.0 mg/l at any time outside the immediate area of operation*

g) *Any condition of pollution or nuisance*

Typically turbidity measurements are taken 30 meters (100 ft) up and down current and 100 meters (300 ft) down current. These turbidity measurements are then compared to a control site. The permit requirements as provided above allow a 20% increase of the background levels at the disposal site.

In order to dispose of contaminated sediments in the Port of Los Angeles in a manner that meets regulatory requirements as well as the Port's best practice, the following dredge and disposal procedure has been developed. It is expected that the procedures will meet the above requirements, which will be verified during construction:

1. Contaminated sediments from dike key dredging will be side cast into the Berth 243-245 landfill using a closed bucket.
2. Contaminated sediments from various berths will be removed using a Clamshell dredge with a closed bucket.
3. At the dredge site overflow from the barges is limited to a maximum of 15 minutes (cumulative flow back time per barge).
4. During transportation of the contaminated material with the Scows or Split Hopper Barges no overflow is allowed.
5. At the disposal location, materials placed below -12.0 ft MLLW can be placed by bottom dumping from scow or barge.
6. At the disposal location, materials placed above -12.0 ft MLLW must be re-handled from a scow or barge.

7. The contaminated material will be confined during the dumping / placement process because the materials will be dumped inside the tubs, or when the level becomes above the level of the tubs by means of underwater dikes or by dikes above the water surface. These dikes will retain and prevent the material from flowing out of the designated area.
8. The measurements as defined in the permit will be undertaken and the dredge and disposal process will remain within the permit limits.

The proposed methodology is in line with previous studies undertaken by the Port of Los Angeles and the US Army Corps of Engineers.

4.5 Contaminated Material Disposal Sites – Alternatives Evaluated

A number of alternative locations have been considered for disposal of the contaminated material:

A. Upland Disposal at Anchorage Road Soil Storage Site
B. Southwest Marine Shipyard (Berth 243-245)

Option A is considered for SEIS/SEIR alternative 2, Environmental Enhancement and Ocean Disposal. Option B is considered for alternative 1 of the SEIS/SEIR, Port Development and Environmental Enhancement.

Upland Disposal at Anchorage Road Soil Storage Site (ARSSS)

This disposal option involves disposing the contaminated sediments from the Channel Deepening Project at the ARSSS. The ARSSS is an upland soil storage site that has been approved by the LARWQCB for disposal of dredge materials that are unsuitable for open water disposal. The site encompasses approximately 31 acres and was modified for use as a soil storage facility in the early 1990s. The site is used on an infrequent basis, largely for maintenance dredging (typically every two to three years) and other miscellaneous capital improvement projects. The dredge material deposited at this site is material that after testing has been found to be unsuitable for open water disposal but is not classified as hazardous waste. The ARSSS has limited capacity and was considered for disposal of the material that is unsuitable for ocean disposal. The contaminated sediments would be dredged and placed in barges where it would be transported to an offloading site located along Shore road, which is adjacent to Anchorage Road. There the sediments would be offloaded from the barges by Clamshell onto an onshore staging area from which it would be loaded onto trucks for a short haul to the ARSSS. The total fill capacity of the ARSSS is approximately 400,000 CY. Placement of approximately 140,000 CY of contaminated sediments dredged from the

channel deepening project would bring the elevation up to approximately +20' MLLW.

Southwest Marine Shipyard (Berth 243-245)

The Berths 243-245 disposal site, which consists of two open water slips covering approximately 8 acres, was part of the former Southwest Marine Shipyard site. This site, along with a vacant adjacent parcel to the north, Berth 240Z, was occupied by a number of ship builders and repair operations for nearly 100 years. No tenant currently occupies the site. The slips at Berths 243-245 contain contaminated sediments from past shipyard operations (Weston, 2005). Generally, sediment samples taken from this area were strongly influenced by high concentrations of 4'4-DDT, dibutyltin cadmium, and mercury. This contamination is likely attributed to past dry dock operations. This option includes creating a CDF for the existing contaminated materials within Berths 243-245, as well as for contaminated dredge material associated with completing the Channel Deepening Project which is unsuitable for open water disposal.

The total capacity of the Berth 243-245 disposal site is approximately 458,000 CY to be placed over an area of about 8 acres. About 90,000 CY would be dredged for a foundation trench needed for dike construction, leaving about 368,000 CY available for Channel Deepening material.

Groundwater Impact

The Berth 243-245 slip is primarily underlain by coarse grained materials. However, seepage of contaminants from the fill should not be a problem. This conclusion is based on the fact that contaminants are strongly bound to sediment particles in that the elutriate extracts and/or suspended phase toxicity tests(Kinnetic Laboratories, Ref 2) showed that little to no dilutions would be required to meet ambient water quality standards. Contaminated sediments will be placed below the zone of tidal influence and therefore no flow gradient will occur to wash contaminants out.

Dike Design

Several dike alignments for the Berth 243-245 disposal site have been analyzed. General considerations for setting the dike alignment included (in order of precedence):

- Fitting in with possible future development at site
- Maintaining offsets from channel
- Providing sufficient wharf length
- Tying in with existing revetments adjacent to site
- Maximizing fill volume

The selected dike design aligns the dike with the existing pierhead line. This alignment will provide a longer length of straight wharf at the existing slip, but 'breaks' the wharf alignment for long term development. The proposed dike will be an offset of 116 ft off of the U.S. Pierhead line and an additional 125 ft from the federal channel limits. The quarry run rock dike will slope 1.75:1 to an elevation of -53 ft MLLW. The dike would tie-in to existing slopes adjacent to the slip and would create a possible future total length of 'straight wharf at the slip of 746'. In a possible future scenario there would be kinks in a future wharf alignment at Pierhead points US 303 and US 305.

This design would require an estimated 90,000 CY of sediment to be dredged for a foundation trench needed for dike construction. An estimated 133,448 CY (185,560 tons) will be needed for the quarry run and an estimated 170,000 CY (275,570 tons) of coarse grained material will be required to create a 10 ft geotechnical sand berm and a 10 ft CDF cap. A total volume of approximately 288,000 CY is available for placement of contaminated material will fill the CDF. This estimate includes the 90,000 CY of the contaminated fill is material dredged during dike foundation trench construction. The remaining capacity of 198,000 CY will be used for disposal of berth dredge material of the Channel Deepening project.

Surface Cover Layer

At this time there are no specific development plans for use of the Berth 243-245 Fill site. Reasonably foreseeable use of this landfill is for relocated fishing industry operations from Fish Harbor. Bulldozers would be used for final grading and a surface cover layer of sand would be placed on the site.

Maximum Reclamation Levels

In relation to the development levels it is also noted that the placement method influences the maximum levels of material placement. For the situation where the material is bottom dumped, the maximum fill level is to -12 ft MLLW. This is related to the draft of the scows and barges and using the higher tides for placing upper layers. Material placed on higher levels is then either placed by re-handling from the scows or barges, or alternatively by means of pumping the material. The required future top level of the Berth 243-245 slip area is at +11 ft MLLW.

Settlements

Eleven core samples were collected at the location of the proposed Berth 243-245 landfill in a recent study conducted by Weston Solutions, Inc. (November 2005). Results indicated that an average of 54.89% of the sampled material within the Berth 243-245 Slips is comprised of silt and clay. This material is expected to undergo consolidation. As a result, wick drains and surcharge will be installed on the site.

Layout and Capacity

Based on different configurations developed during consecutive engineering stages, a layout has been developed (refer to Figure 2). A distinction has been made between materials placed below -12 ft MLLW and materials placed above -12 ft MLLW. Materials placed below -12 ft MLLW can be placed by bottom dumping from scow or barge. Contaminated materials placed above -12 ft MLLW must be re-handled from a scow or barge. Uncontaminated materials placed above -12 ft MLLW can be hydraulically pumped into the disposal site.

The overall dimensions of the CDF have now been determined by the boundaries on the north, east, and south side (existing landfill limits) and on the west side by locating the rock dike at a position to maximize the length of straight wharf at the existing slip.

The following table provides the volumes of fill required related to different material types and fill elevations.

Description [-]	Fine Grained Up to -12' Cubic Yards	Fine Grained Above -12' Cubic Yards	Coarse Grained Cubic Yards	Total Fill Cubic Yards
7.14 acres capacity	217,000	71,000	170,000	458,000

The total contaminated fill volume is presently estimated at approximately 170 KCY. If we assume a 14% increase from dredge to fill volume it is required to dispose approximately 194 KCY of contaminated dredge material within the fill. The above table shows that the contaminated material can be placed below -12 ft.

4.6 Contaminated Sediment Dredge and Disposal Plan

This section summarizes the previous findings and combines these into one overall contaminated sediment management plan.

Dredge method available:

- Clamshell Dredge
- Cutter Suction Dredge

Areas with contaminated material (approximate quantities), see Figure 8:

- Southwest Marine Shipyard (Berth 243-245) 90,000 CY[s1]

- Berth Dredging 80,000 CY
- Total: 170,000 CY

Suitable disposal site:

- Southwest Marine Shipyard (Berth 243-245)
- Anchorage Road Soil Storage Site (ARSSS)

The Southwest Marine Shipyard (Berth 243-245) is carried forward as part of the recommended alternative per SEIS/SEIR.

5.0 Construction

5.1 Construction Methodology

The anticipated construction schedule for the remaining Channel Deepening project is shown in Figure 10. The Berth 243-245 landfill will require a surcharge height of approximately 20 ft and will require the use of wick drains. The development schedule for the Berth 243-245 landfill will be coordinated with the Channel Deepening project.

The Construction Methodology (for CDF only) is as follows:

1. Contractor will demolish existing structures in the new CDF locations.
2. Dike foundation trench (key) dredging will then progress. This material will be dredged by Clamshell and side cast into the slip.
3. After installation of the trench foundation the rock dike construction will progress, and the first lift of the rock dikes will be constructed.
4. After completion of the first rock dike lift the sand will be placed behind the dike. This sand is a geotechnical requirement for stability of the dikes. Sand will become available from the Main Channel Deepening Project.
5. The Clamshell dredge will have completed dredging of dike key material inside the Berth 243-245 slip and will progress to the various berth dredge locations. This material will then be placed by bottom dumping from the scows inside the partial completed CDF.
6. The contaminated dredge material will be placed with barges working in water depths greater than -12 ft MLLW.

7. The dike on the west perimeter will remain at -12 ft MLLW until all contaminated materials from various berth dredging locations have been placed inside the CDF.
8. After placement of the last contaminated element, fill will be installed and the remainder of the geotechnical sand blanket will be installed.
9. A Cutter Suction Dredge will then place a coarse grained sand layer from elevation +1 ft to +11 ft MLLW. The sand will become available from the Main Channel Deepening Project.
10. Next the Contractor will place a gravel blanket over the side that will accommodate lateral drainage for the wick drains.
11. The Contractor will install wick drains, after which 20 ft of surcharge material will be placed on top of the CDF. Surcharge will become available from the Southwest Slip surcharge and will most likely be trucked. The surcharge will remain in place for 9 months.
12. After completion of the surcharge period, the site will be available to the utilities contractor whom will remove remaining surcharge material, construct the utilities, and infrastructure.

5.2 Dredging and Disposal Operations – Water Quality Monitoring

The following sampling protocol shall be undertaken during the dredging and/or fill project. Sampling for the receiving water monitoring shall commence at least one week prior to the start of the dredging and fill operations and continue at least one week following the completion of all such operations. Sampling shall be conducted a minimum of once a week during dredging operations. Sampling shall be conducted down current of the dredge sites or of the fill sites at least one hour after the start of dredging operations. For the case of a confined fill area for disposal, sampling stations shall be referenced to the overflow weir of the confined fill site (i.e. the discharge point to the harbor receiving waters). All receiving water monitoring data shall be obtained via grab samples or remote electronic detection equipment. Receiving water samples shall be taken at the following stations:

Station	*Description*
A	30 meters (100 ft) up current of the dredging/disposal operations, safety permitting.
B	30 meters (100 ft) down current of the dredging/disposal operations, safety permitting.

C — 100 meters (300 ft) down current of the dredging/disposal operations

D — Control site (area not affected by dredging/disposal operations).

The following shall constitute the receiving water monitoring program:

Water Column Monitoring

Parameters	*Units*	*Station*	*Frequency*
Dissolved Oxygen[1]	mg/l	A thru D	Weekly[2]
Light Transmittance[1]	% Transmittance	A thru D	Weekly
pH[1]	pH units	A thru D	Weekly
Suspended Solids[3]	mg/l	A thru D	Twice Monthly

[1] Measurements shall be taken throughout the water column (at a minimum, at 2-meter (6 ft) increments).
[2] During the first two weeks of dredging, stations shall be sampled four times per week.
[3] Mid-depth shall be sampled.

Water column light transmittance values from Stations C and D shall be averaged for the near surface (1 meter (3 ft) below the surface), mid-water and bottom (1 meter (3 ft) above the bottom). If the difference in % light transmittance is 30% or greater (based on a comparison of the averaged values at the two stations), water samples shall be collected at mid-depth (or the depth at which the maximum turbidity occurs) and analyzed for trace metals, DDT, PCBs, and PAHs. At a minimum, one set of water samples shall be collected and analyzed for these chemical constituents during the maintenance dredging operation. Analyte reporting limits shall be appropriately low to allow comparisons with water quality standards applicable to the harbor receiving waters.

Color photography shall be taken at the time of sampling to record the presence and extent of visible effects of dredging operations. These photographs shall be submitted with the receiving water monitoring reports.

The discharger shall provide Regional Board staff with a receiving water monitoring field schedule at least one week prior to initiating the program. Regional Board staff shall be notified of any changes in the field schedule at least 48 hours in advance.

Observations

The following receiving water observations shall be made and logged daily during dredging or excavating operations:

a. Date and time;

b. Direction and estimated speed of currents;

c. General weather conditions and wind velocity;

d. Tide stage;

e. Appearance of trash, floatable material, grease, oil or oily slick, or other objectionable materials;

f. Discoloration and/or turbidity;

g. Odors;

h. Depth of dredge operations during previous day;

i. Amount of material dredged the previous day;

j. Cumulative total amount of material dredged to date.

General Provisions

All sampling, sample preservation, and analyses shall be performed in accordance with the latest edition of "Guidelines Establishing Test Procedures for Analysis of Pollutants" promulgated by the United States Environmental Protection Agency.

All chemical analyses shall be conducted at a laboratory certified for such analysis by the State Department of Health Services, or approved by the Executive Officer.

The discharger shall calibrate and perform maintenance procedures on all monitoring instruments and equipment to insure accuracy of measurements, or shall insure that both activities will be conducted.

A grab sample is defined as an individual sample collected in fewer than 15 minutes.

All samples shall be representative of the waste discharge under normal operating conditions.

Reporting

Monitoring reports shall be submitted within 10 days following each weekly sampling period. In reporting, the discharger shall arrange the monitoring in tabular form so that dates, times, parameters, test data, and observations are readily discernible. The data shall be summarized to demonstrate compliance with the waste discharge requirements. A final report, summarizing the results of the weekly monitoring and reporting the total volume discharged, shall be submitted within one month of completion of the project.

Each monitoring report must affirm in writing that:

All analyses were conducted at a laboratory certified for such analyses by the State Water Resources Control Board or approved by the Executive Officer and in accordance with current EPA guidelines or as specified in the Monitoring Program.

For any analysis performed for which no procedure is specified in the EPA guidelines or in the Monitoring Program, the constituent or parameter analyzed and the method or procedure used must be specified in the report.

General Provisions for Reporting

For every item where the requirements are not met, the discharger shall submit a statement of actions undertaken or proposed which will bring the discharge into full compliance with requirements at the earliest time and submit a timetable for correction.

6.0 References

1. *DMJM Harris (2002). Draft Contaminated Sediment Management Plan, Briefing Memo No. 1. January 2002.*

2. *Kinnetic Laboratories, Inc. and Fugro West, Inc. (2006). Draft Report, Environmental Evaluation of Sediments, Port of Los Angeles 2006 Marine Exploration Program, Volume I. Maintenance Dredging Sediments. Prepared for Los Angeles Dredge Contractors & Port of Los Angeles Engineering Division. November 2006.*

3. *Kinnetic Laboratories, Inc. and Fugro West, Inc. (2007). Appendices, Environmental Evaluation of Sediments, Port of Los Angeles 2006 Marine Exploration Program, Volume II. Berth Deepening, Fill Sites, Cerritos Channel Widening, and Consolidated Slip Remediation. Prepared for Los Angeles Dredge Contractors & Los Angeles Harbor Department. June 2007.*

4. *Port of Los Angeles Channel Deepening Project Supplemental EIS/EIR (2006). Chapter 2. Description of Proposed Project and Alternatives. October, 2006.*

5. *Weston Solutions, Inc. (2005). Draft Report, Chemical and Geotechnical Characterization of Sediments in the Vicinity of Southwest Marine, Port of Los Angeles. Prepared for the Port of Los Angeles. November 2005.*

6. *Draft Supplemental Environmental Impact Statement/Supplemental Environmental Impact report (SEIS/SEIR). Port of Los Angeles Channel Deepening Project, July 2008.*

7. *Contaminated Sediment Management Plan Addendum 1, May 2003, DMJM Harris.*

FIGURES

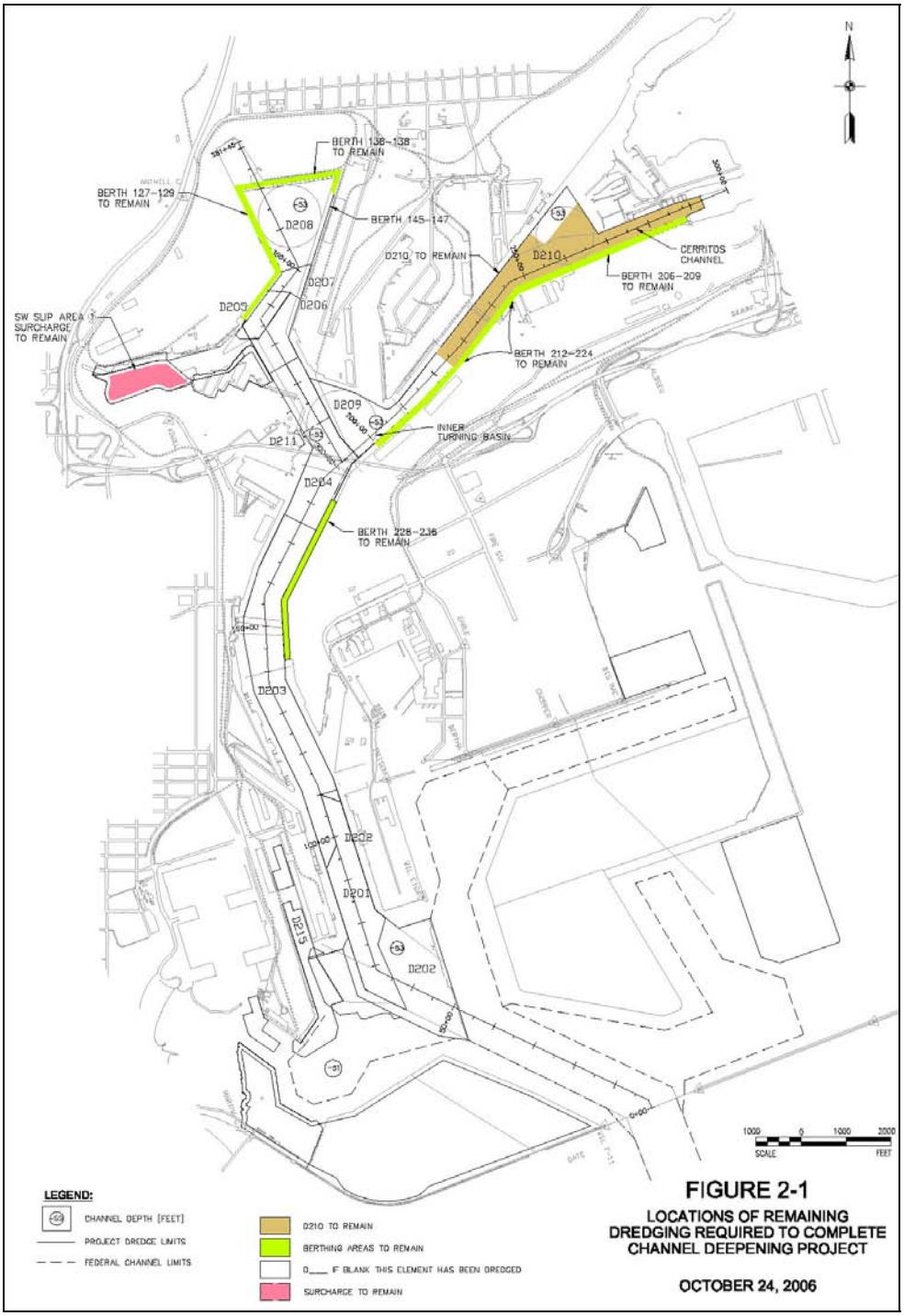


Figure 1 – Locations of Remaining Dredging Required to Complete Channel Deepening Project

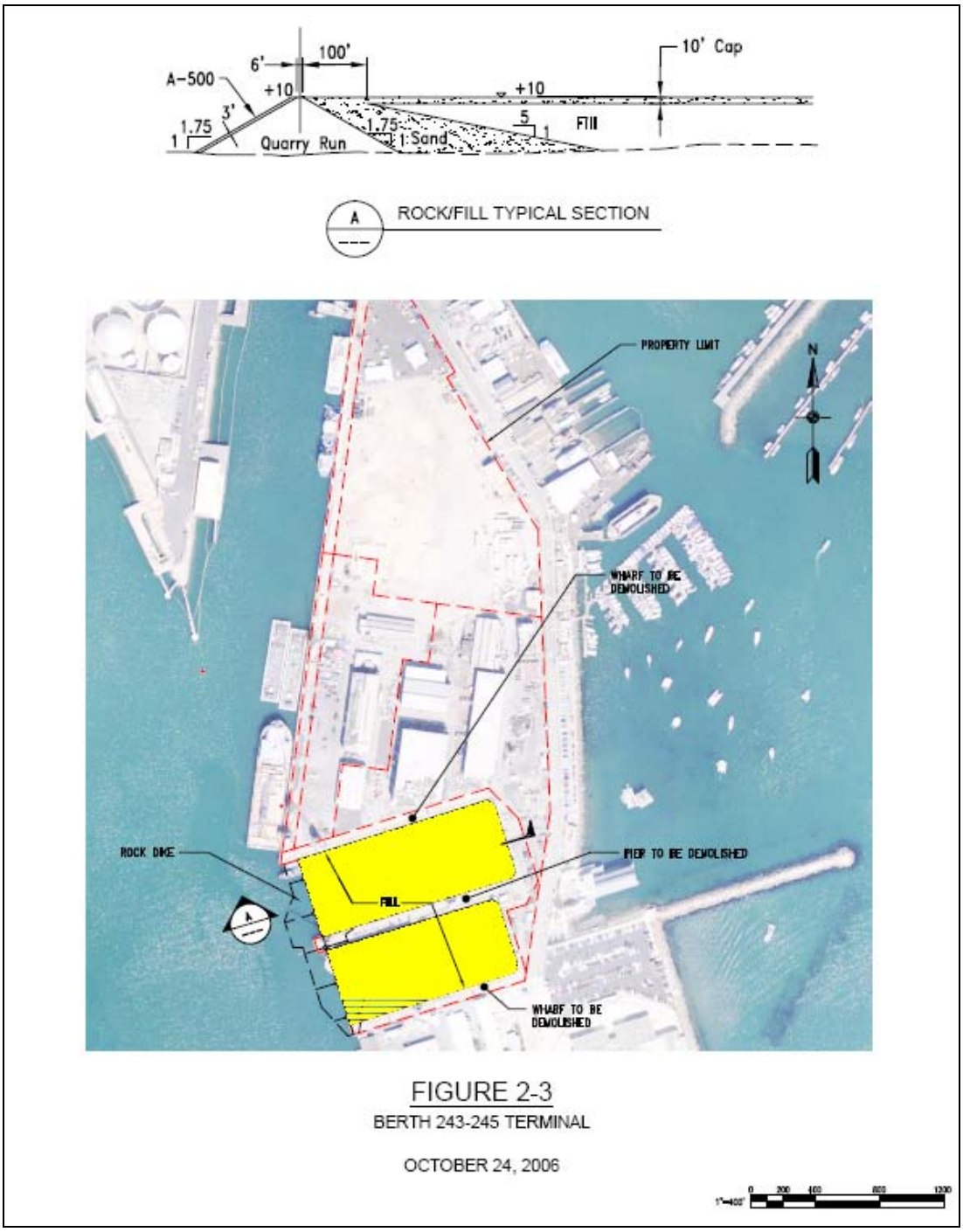


Figure 2 – Berth 243-245 Terminal

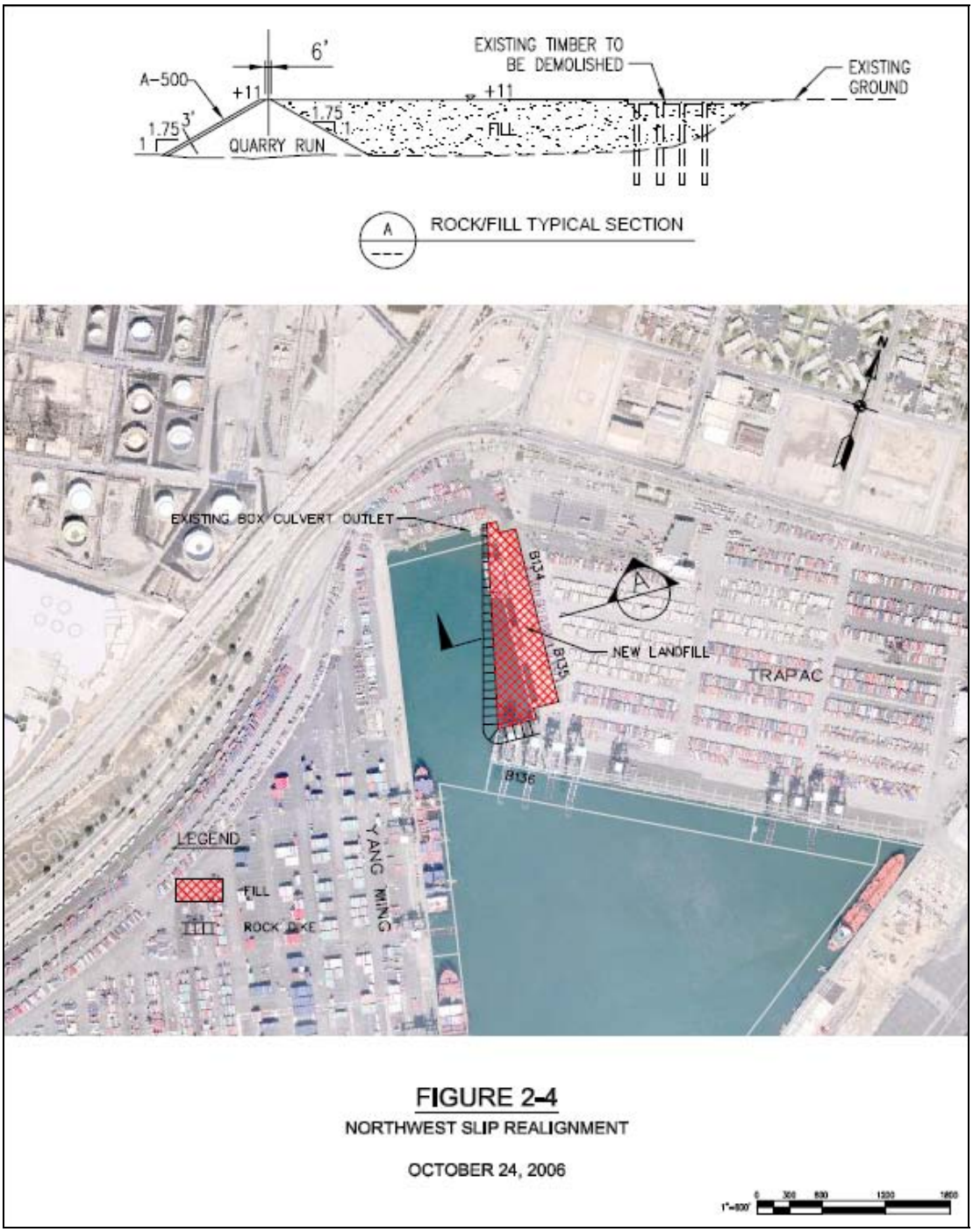


Figure 3 – Northwest Slip Fill

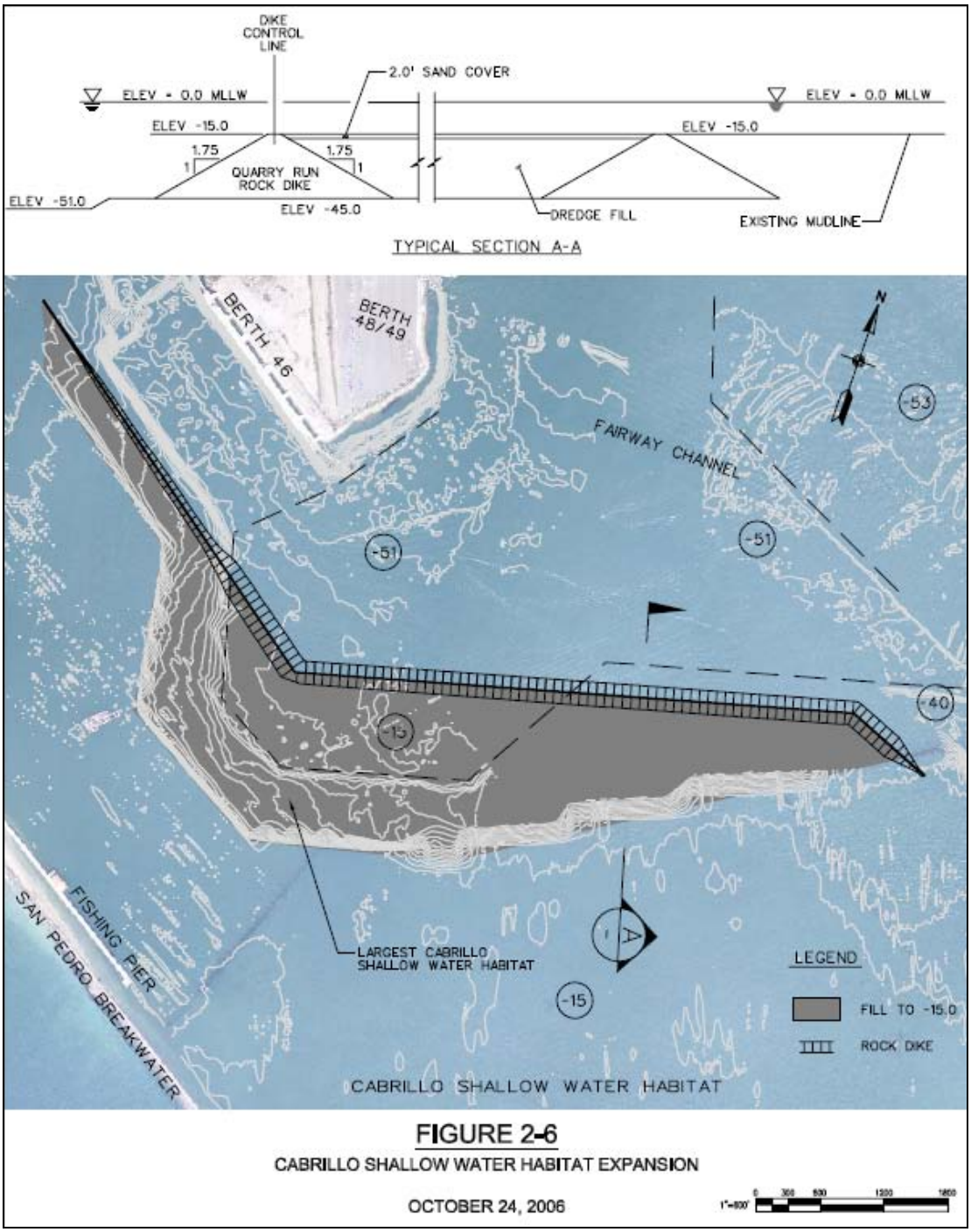


Figure 4 – Cabrillo Shallow Water Habitat Expansion

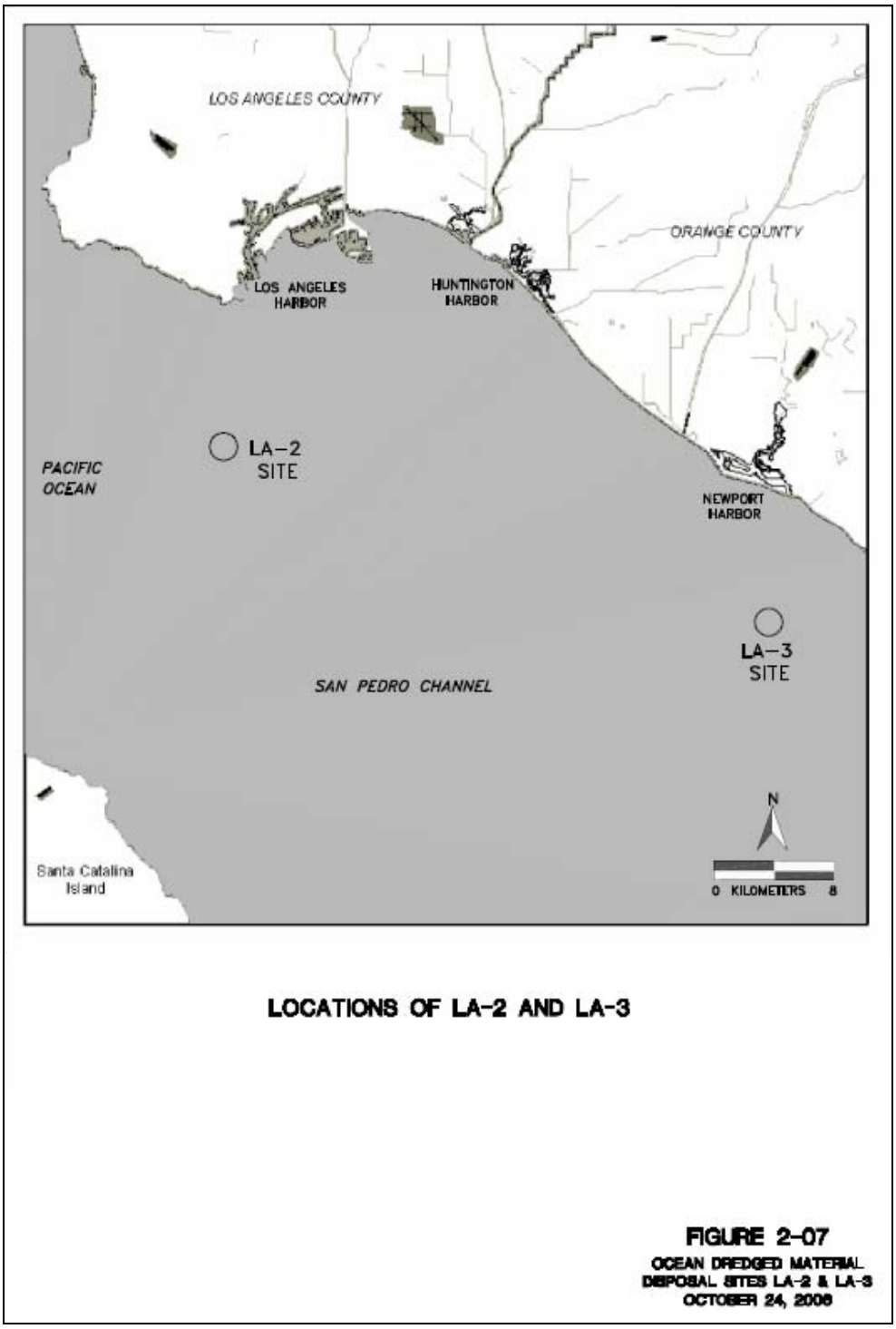


Figure 5 – Location of LA-2 Offshore Disposal Site

Figure 6 – Anchorage Road Soil Storage Site

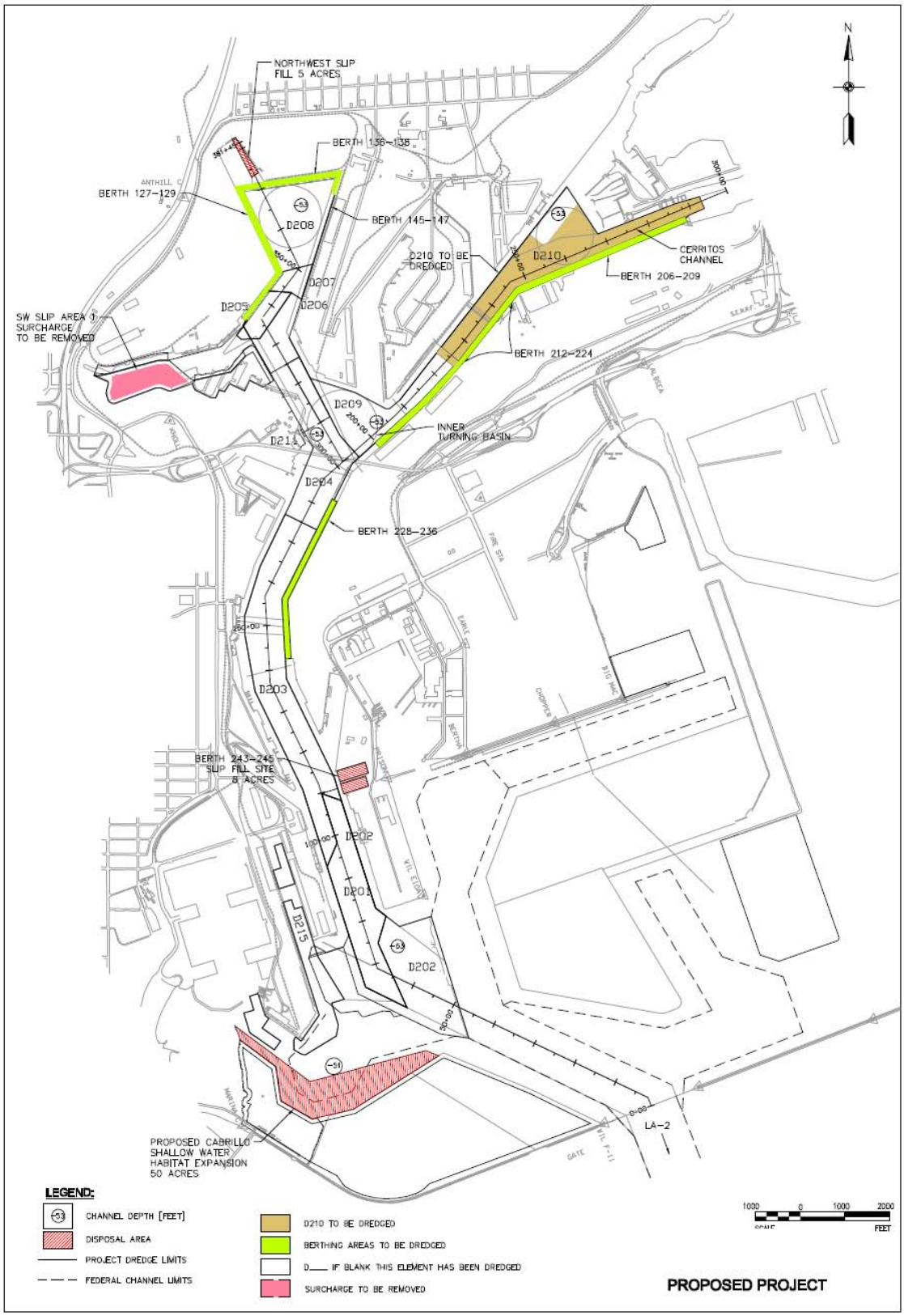
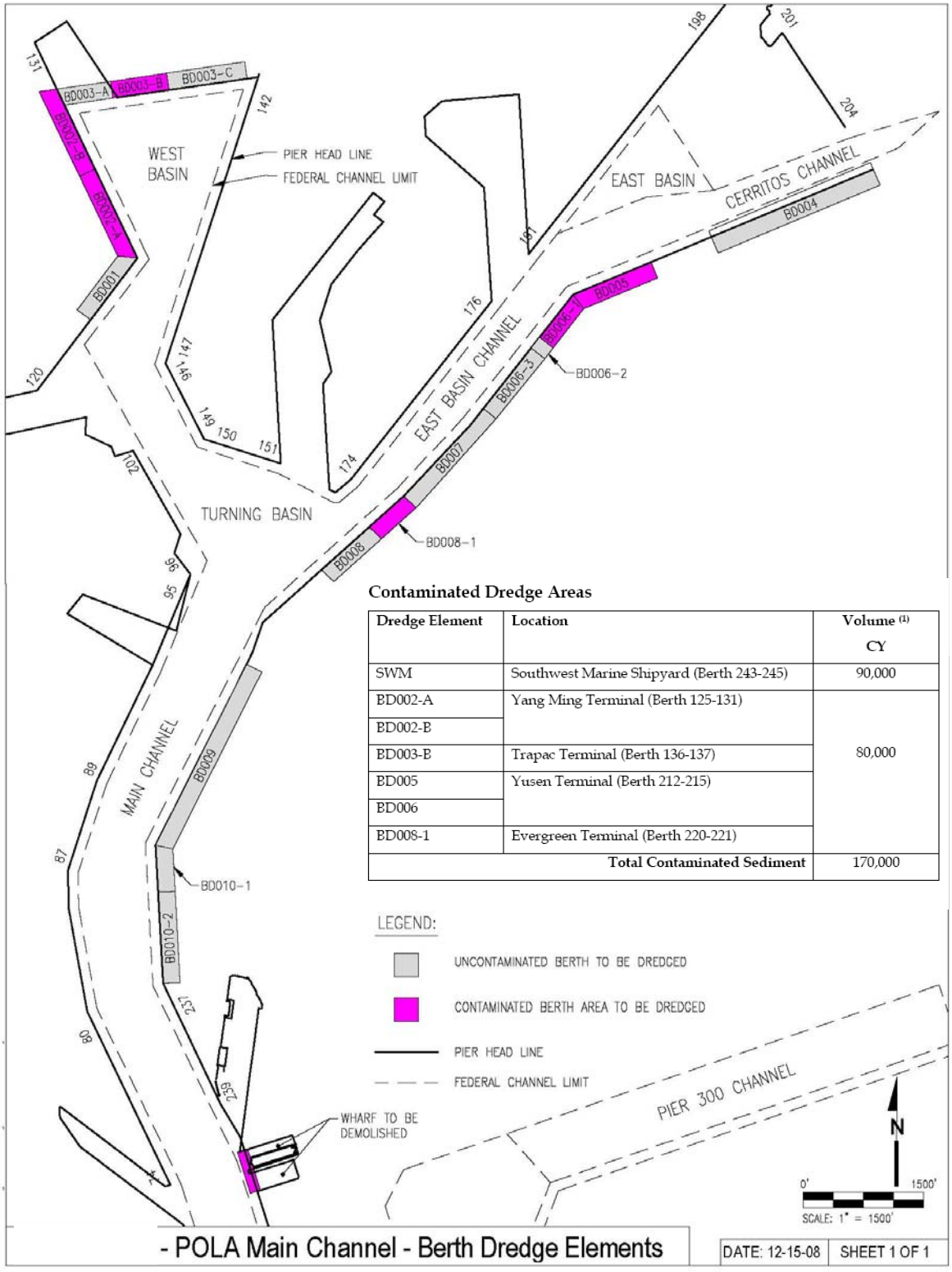


Figure 7 – Proposed Project

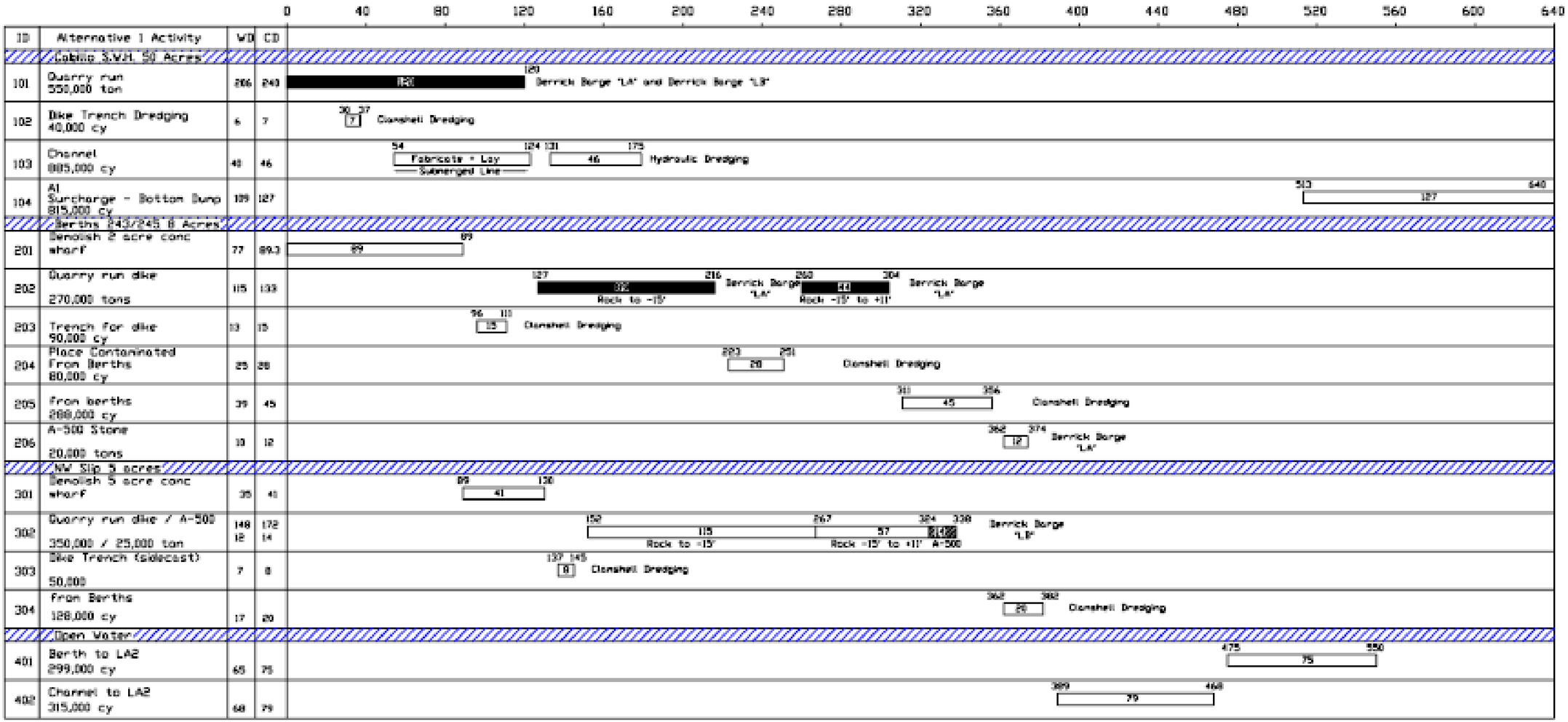


Contaminated Dredge Areas

Dredge Element	Location	Volume [1] CY
SWM	Southwest Marine Shipyard (Berth 243-245)	90,000
BD002-A	Yang Ming Terminal (Berth 125-131)	80,000
BD002-B		
BD003-B	Trapac Terminal (Berth 136-137)	
BD005	Yusen Terminal (Berth 212-215)	
BD006		
BD008-1	Evergreen Terminal (Berth 220-221)	
	Total Contaminated Sediment	170,000

Figure 8 – Contaminated Sediment Dredge Areas

Figure 9 – POLA Main Channel – Project Schedule



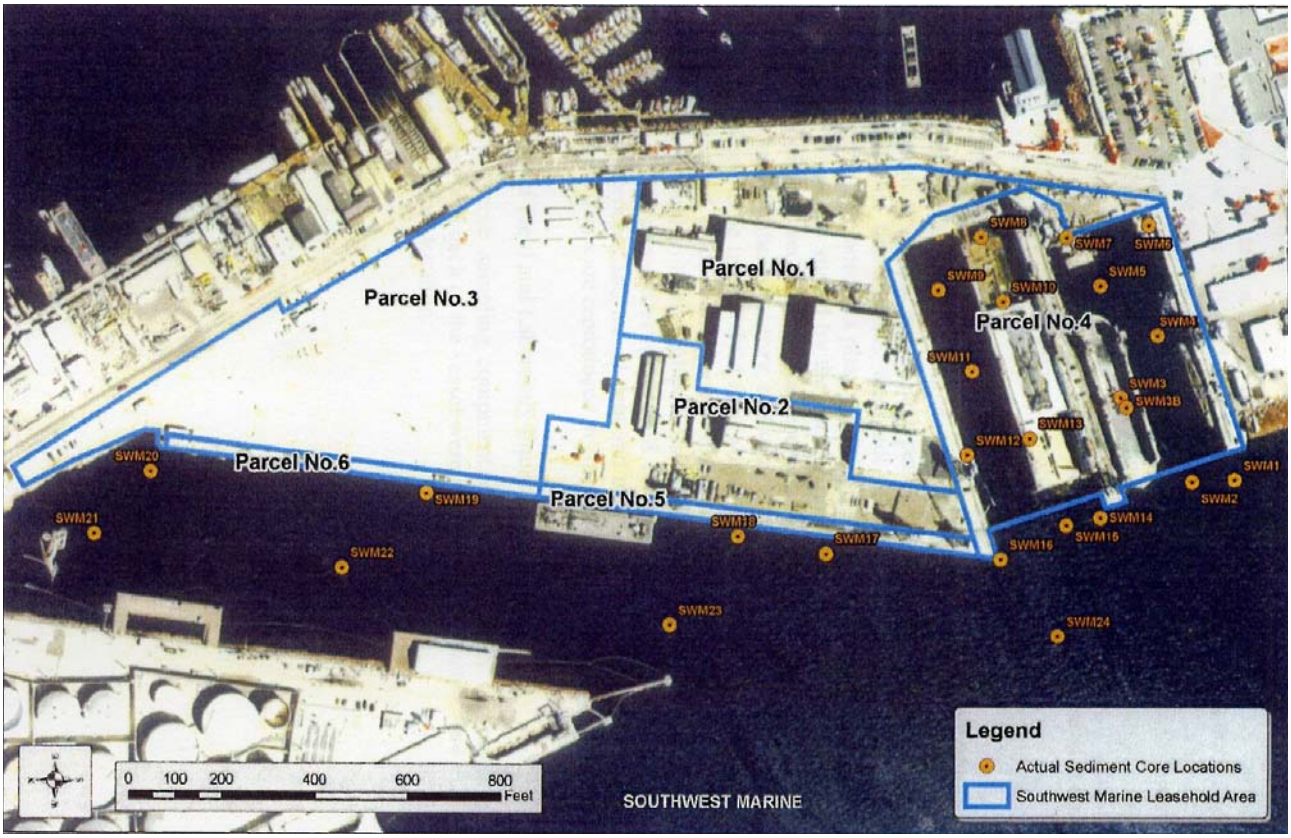


Figure 10 – Sample Locations at Southwest Marine (Berth 243-245 Terminal)

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Table 1. Summary of Testing Results and Disposal Option Recommendations for Sediments Tested Under the 2006 Marine Exploration Program.

Type of Sample	Composite Sample ID	Year Sampled	Current Dredge Volume* (CY)	Max. Sampling Elevation (feet MLLW)	Material Properties			Environmental Suitability					Comments
					Composite Grain Size			Open Water			Fill		
					% Sand	% Silt	% Clay	LA2	LA3	In Harbor	CDF	Upland	
Berth Maintenance Dredging and Future Deepening													
Maintenance	118-121	2006	1,300	-44	72	16	12	NT	NT	NT	YES	YES	Hg, DDE, tDDT, 7 PAH compounds, & tPAHs > ERL; EET bivalve larvae EC_{50} & LC_{50}>100%
Deepening	118-121-E	2006		-48	98	1	1	YES	NT	YES	YES	YES	No ERL/ERM exceedances (only bulk sediment chemistry performed)
Maintenance Deepening	122-124	2003	118,000 (3,400 for Maintenance)	-55	78	13	9	YES	NT	YES	YES	YES	tDDT > ERL; SET & EET TBT > chronic criterion; no significant toxicity; no significant bioaccumulation
	125-126	2003		-55	55	25	21	NO	NT	NO	YES	YES	As, Cu, Pb, Hg, Ni, Zn, tDDT & PAHs > ERL; DDE & PCBs > ERM; SET & EET TBT > chronic criterion; SET bivalve larvae EC_{50} = 69% & LC_{50} = 71%; significant amphipod toxicity (LPC not exceeded); significant bioaccumulation of Pb, Zn, PCBs & 5 PAH compounds
Maintenance	127-131 Top	2003	30,100	-47	70	15	15	NO	NT	NO	YES	YES	Cu, Hg, DDE & tDDT > ERL; PCBs > ERM; elutriate TBT > chronic criterion; amphipod toxicity (LPC exceeded); significant bioaccumulation of Cu, Pb, Zn, PCBs, several PAHs & tPAHs
Deepening	127-131 Deep	2003	37,700	-55	88	6	6	NO	NT	NO	YES	YES	DDE, tDDT & tPCBs > ERL; elutriate TBT > chronic criterion; significant bioaccumulation of Cr, Cu, Pb, Zn, PCBs, several PAHs & tPAHs
Maintenance	136-137 Top	2006	10,500	-47	54	24	22	NT	NT	NT	YES	YES	As, Cu, Ni, DDE, tDDT & tPCBs > ERL; EET bivalve larvae EC_{50} & LC_{50} > 100%
	138-140 Top	2006		-48	68	17	15	NT	NT	NT	YES	YES	Cu, Hg & Ni>ERL; EET bivalve larvae EC_{50} & LC_{50} > 100%
Deepening	136-137 Bot	2006	40,700	-57	81	10	9	NO	NT	NO	YES	YES	Hg, DDE, tDDT, tPCBs & 4 PAHs > ERL; 9 PAHs, HPAHs & LPAHs > ERM; SET tPCBs . chronic criterion; SET bivalve larvae EC_{50} = 97.2; SET fish LC_{50} = 34% (LPC not exceeded); significant benthic toxicity (LPC exceeded for LA2 & P400); tissues not analyzed due to toxicity
	138-140 Bot	2006		-57	85	8	7	Marginal (Amphipod Toxicity)	NT	YES	YES	YES	No ERL/ERM exceedances; SET & EET TBT > chronic criterion; significant amphipod toxicity (LPC exceeded for LA2); significant bioaccumulation of Pb, Ni, DDE, tDDT, PCBs, LPAHs, HPAHs & tPAHs
Maintenance	153-155	2003	13,300	-39	42	31	27	NT	NT	NT	YES	YES	As, Cu, Ni, Pb & PAHs > ERL; Hg, DDD, DDE, DDT, tDDT & pyrene > ERM; SET As > CCC; background water, SET & MET TBT > chronic criterion; EET bivalve larvae EC_{50} = 69.5% & EET LC_{50} = 73.9% (LPC not exceeded)
Maintenance	163-164	2006	3,800	-44	53	23	24	NT	NT	NT	YES	YES	As, Cu, Hg, DDE & tDDT > ERL; EET bivalve larvae EC_{50} & LC_{50} > 100%
Maintenance	173 A Top	2005	35,500	-43 (avg.)	43	38	19	NT	NT	NT	YES	YES	As, Cr, Cu, Pb, Hg, Ni, Zn, DDD, DDE, tDDT & HPAHs > ERL; bivalve larvae EC_{50} & LC_{50} > 100%
	173 A Bot	2005		-47	76	16	8	NT	NT	NT	YES	YES	Cu, Hg, DDE, tDDT & anthracene >ERL; bivalve larvae EC_{50} & LC_{50} > 100%
	173 B Top	2005		-27 (avg.)	48	34	18	NT	NT	NT	YES	YES	As, Cr, Cu, Pb, Hg, Ni, Zn, PCBs, tPAHs, LPAHs & HPAHs > ERL; anthracene > ERM; bivalve larvae EC_{50} & LC_{50} > 100%
	173 B Bot	2005		-33 (avg.)	82	13	5	NT	NT	NT	YES	YES	No exceedances; bivalve larvae EC_{50} & LC_{50} > 100%
	174-176	2006	8,900	-49	53	29	18	NT	NT	NT	YES	YES	As, Cu, Hg, Ni, DDE & tDDT > ERL; EET bivalve larvae EC_{50} & LC_{50} > 100%
Maintenance	177-179	2003	10,400	-38	42	33	25	NT	NT	NT	YES	YES	As, Cd, Cu, Pb, Ni & Zn > ERL; Hg, DDD, DDE, DDT tDDT & PCBs > ERM; SET & EET TBT > chronic criteria; EET bivalve larvae EC_{50} & LC_{50} > 100%
Maintenance	180-181	2003	8,200	-37	37	32	31	NT	NT	NT	YES	YES	As, Cd, Cr & Cu > ERL; Hg, Pb, Ni, Zn, DDD, DDE & tDDT > ERM; EET bivalve larvae EC_{50} & LC_{50} > 100%

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Table 1. Summary of Testing Results and Disposal Option Recommendations for Sediments Tested Under the 2006 Marine Exploration Program.

Type of Sample	Composite Sample ID	Year Sampled	Current Dredge Volume* (CY)	Max. Sampling Elevation (feet MLLW)	Material Properties			Environmental Suitability					Comments
					Composite Grain Size			Open Water			Fill		
					% Sand	% Silt	% Clay	LA2	LA3	In Harbor	CDF	Upland	
Maintenance	191-192	2006	4,900	-43	38	40	22	NT	NT	NT	YES	YES	As, Cu, Pb, Hg, Ni, Zn, DDD, DDE, tDDT, tChlor & 4 PAHs > ERL; EET bivalve larvae EC_{50} & LC_{50} > 100%
Maintenance	195-196	2006	14,600	-41	32	44	24	NT	NT	NT	YES	YES	As, Cr, Cu, Pb, Ni, Zn, tPCBs, 5 PAHs & tPAH > ERL; DDD, DDE, tDDT, tChlordane & fluoranthene > ERM; EET bivalve larvae EC_{50} & LC_{50} > 100%
	197-199	2006		-41	25	43	32	NT	NT	NT	Marginal (Sol. Pb)	Marginal (Sol. Pb)	As, Cd, Cr, Cu, Pb, Ni, Zn, tChlordane, tPCBs & 2 PAHs > ERL; DDD, DDE, tDDT, 9 PAHs & tPAH> ERM; EET TBT > chronic criterion; Soluble Pb > STLC; EET bivalve larvae EC_{50} = 77% & LC_{50} = 79% (LPC not exceeded)
Maintenance	200A	2006	5,300	-41	32	39	29	NT	NT	NT	Marginal (bivalve toxicity)	Marginal (Sol. Pb)	As, Cd, Cr, Cu, Pb, Hg, Ni, Zn, DDD, DDE, tDDT, tPCBs, 4 PAHs & tPAH> ERL; tChlordane, & 6 PAHs > ERM; EET TBT > chronic criterion; Soluble Pb > STLC; Bivalve larvae EC_{50} = 30% & LC_{50} = 30% (LPC exceeded)
Maintenance	206-207 Top	2006	147	-48	31	39	30	NT	NT	NT	YES	YES	As, Cu, Hg, Ni, Zn DDE & tDDT > ERL; EET bivalve larvae EC_{50} & LC_{50} > 100%
Maintenance	208-209 Top	2006	746	-47	38	40	22	NT	NT	NT	YES	YES	Cu, Hg, DDE & tDDT > ERL; EET bivalve larvae EC_{50} & LC_{50} > 100%
Deepening	206-207 Bot	2006	69,200	-57	20	58	22	YES	NT	YES	YES	YES	No ERL/ERM exceedances; SET fish LC_{50} = 94.4%; minor but significant bioaccumulation of Cu, Ni & Zn (LA2 only)
	208-209 Bot	2006		-57	30	51	18	YES	NT	YES	YES	YES	Ni > ERL; SET fish LC_{50} = 43.8%; minor but significant bioaccumulation of Cu & Pb
Maintenance	210-211	2006	2,300	-41	43	37	20	NT	NT	NT	YES	YES	As, Cd, Cu, Pb, Ni, DDD, tChlordane, 11 PAHs & tPAH > ERL; Hg, Zn, DDE, tDDT & tPCBs > ERM; EET bivalve larvae EC_{50} & LC_{50} > 100%
Maintenance	212-213 Top	2006	31,600	-47	41	37	22	NT	NT	NT	YES	YES	As, Cu, Hg, Ni, Zn, DDD, DDE & tDDT > ERL; EET bivalve larvae EC_{50} & LC_{50} > 100%
	214-215 Top	2006			42	37	21	NT	NT	NT	YES	YES	As, Cu, Hg, Ni, DDD, DDE & tDDT > ERL; EET bivalve larvae EC_{50} & LC_{50} > 100%
Maintenance	216-218 Top	2006		-46	38	42	20	NT	NT	NT	YES	YES	As, Cu, Hg DDD, DDE, tDDT & anthracene > ERL; EET bivalve larvae EC_{50} & LC_{50} > 100%
	219T	2006			68	19	13	NT	NT	NT	YES	YES	Cu, Hg, DDE & tDDT > ERL; EET bivalve larvae EC_{50} & LC_{50} > 100%
	220-221 Top	2006			76	13	11	NT	NT	NT	YES	YES	Cu, Hg, DDE & tDDT > ERL; EET bivalve larvae EC_{50} & LC_{50} > 100%
Maintenance	222-225 Top	2006		-39	52	28	20	NT	NT	NT	YES	YES	Cu & Hg > ERL; EET bivalve larvae EC_{50} & LC_{50} > 100%
Deepening	212-213 Bot	2006	287,100	-57	29	47	24	Marginal (Bioaccum)	NT	Marginal (Bioaccum)	YES	YES	DDD, DDE & tDDT > ERL; SET bivalve larvae EC_{50} = 88.3%; EET bivalve larvae EC_{50} = 97.4% & LC_{50} = 99.2%; SET fish LC_{50} = 36.7%; No LPC exceedances with SPP bioassays; minor but significant bioaccumulation of As, Cr, Pb, Ni & Zn; significant bioaccumulation of PCBs, 10 PAHs, HPAHs, LPAHs & tPAHs
	214-215 Bot	2006			24	49	27	Marginal (Bioaccum)	NT	Marginal (Bioaccum)	YES	YES	Cu, Hg, Ni, fluorene, acenaphthene & tPAHs > ERL; 2-methylnaphthalene & LPAHs > ERM; SET bivalve larvae EC_{50} = 78.8%; EET bivalve larvae EC_{50} = 80.6% & LC_{50} = 81%; significant bioaccumulation of Pb, Zn, 15 PAHs, HPAHs, LPAHs & tPAHs
	216-218 Bot	2006			29	47	24	YES	NT	YES	YES	YES	Cu, Hg > ERL; SET fish LC_{50} = 39.1% (LPC not exceeded); EET bivalve larvae EC_{50} = 80.9% & LC_{50} = 81.3%; minor but significant bioaccumulation of As, Cd, Cu, Pb, 7 PAHs, HPAHs, LPAHs & tPAHs
	219 Bot	2006			64	23	14	YES	NT	YES	YES	YES	No ERL/ERM Exceedances; SET tPCBs > CCC; SET fish LC_{50} = 8.4% (LPC not exceeded); minor but significant bioaccumulation of As, Pb, 2 PAHs, LPAHs & tPAHs
	220-221 Bot	2006			87	8	5	Marginal (Amphipod Toxicity)	Marginal (Amphipod Toxicity)	Marginal (Amphipod Toxicity)	YES	YES	tDDT > ERL; SET fish LC_{50} = 61.1% (LPC not exceeded); significant amphipod toxicity (LPC exceeded for LA2, LA3 & P400); minor but significant bioaccumulation of Pb, Zn, 7 PAHs, HPAHs & tPAHs

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Type of Sample	Composite Sample ID	Year Sampled	Current Dredge Volume* (CY)	Max. Sampling Elevation (feet MLLW)	Material Properties			Environmental Suitability					Comments
					Composite Grain Size			Open Water			Fill		
					% Sand	% Silt	% Clay	LA2	LA3	In Harbor	CDF	Upland	
	222-225 Bot	2006			72	16	12	YES	YES	YES	YES	YES	Cu, Hg DDE, tDDT > ERL; SET TBT > chronic criterion; SET fish LC_{50} = 61.1% (LPC not exceeded); minor but significant bioaccumulation of As, Cu, Pb, Hg, Ni, Zn, DDE, tDDT, 7 PAHs, HPAHs, LPAHs &tPAHs
Maintenance	226-231 A	2003	2,400	-48	59	23	19	NO	NT	NO	YES	YES	Cu, Pb, Hg, Ni, PCBs & fluorene > ERL; DDE & tDDT > ERM; SET TBT > chronic criterion; SET bivalve larvae EC_{50} = 72% & LC_{50} = 71%; Significant bioaccumulation of Cu, Zn, DDE, PCBs, 3 PAHs, and tPAHs.
	226-231 B	2003			80	11	9	NO	NT	NO	YES	YES	DDE, tDDT & fluorene >ERL; SET TBT > chronic criterion; significant bioaccumulation of DDE, PCBs, 3 PAHs & tPAHs.
	226-231 C	2003			47	31	22	NO	NT	NO	YES	YES	Cu, Hg, tDDT, PCBs & fluorene >ERL; DDE > ERM; significant bioaccumulation of Cu, Zn, DDE, PCBs, 3 PAHs & tPAHs.
Maintenance	232-233 Top	2006	25,400	-47	75	12	13	NT	NT	NT	YES	YES	DDE & tDDT > ERL; EET bivalve larvae EC_{50} & LC_{50} > 100%
	234-236 Top	2006			67	17	16	NT	NT	NT	YES	YES	Cu, Hg, DDE & tDDT > ERL; EET bivalve larvae EC_{50} & LC_{50} > 100%
Deepening	226-227 Bot	2006	102,400	-57	25	49	27	YES	NT	YES	YES	YES	As, Cu & Ni > ERL; SET bivalve larvae EC_{50} = 30.7%; SET fish LC_{50} = 56.2%; EET bivalve larvae EC_{50} = 68.3% & LC_{50} =69%; LPC not exceeded for any SPP bioassay; minor but significant bioaccumulation of As, Cr, Pb, Ni, Zn & chrysene
	228-229 Bot	2006			78	15	7	Marginal (Bioaccum)	NT	YES	YES	YES	Ni, DDE, t DDT, 7 PAHs, HPAHs & tPAHs > ERL; LPAHs > ERM; SET bivalve larvae EC_{50} = 66%; SET fish LC_{50} = 42%; LPC not exceeded for SPP bioassays; significant bioaccumulation of Cr, Pb, Ni, Zn, 19 PAHs, HPAHs, LPAHs & tPAHs
	230-231 Bot	2006			66	19	15	YES	NT	YES	YES	YES	As, DDE, tDDT > ERL; SET fish LC_{50} = 10% (LPC not exceeded); minor but significant bioaccumulation of Pb, Zn, 10 PAHs, HPAHs, LPAHs & tPAHs
	232-233 Bot	2006			91	5	4	YES	YES	YES	YES	YES	DDE & tDDT > ERL; Hg > ERM; minor but significant bioaccumulation of As, Cd, Cr, Cu, Pb, Ni, Se, Ag, Zn, DDE, tDDT, benzo(k)fluoranthene, pyrene, HPAHs, LPAHs & tPAHs
	234-236 Bot	2006			93	4	3	YES	NT	YES	YES	YES	No ERL/ERM Exceedances; SET fish LC_{50} = 64.3% (LPC not exceeded); minor but significant bioaccumulation of Cu, Pb, tDDT, benzo(b)fluoranthene, benzo(k)fluoranthene, HPAHs & tPAHs
CDF and Berth 258 Dry Dock Construction													
CDF	134 NW Slip	2006	45,000	14 ft bgs	79	10	11	NT	NT	YES for Side-Casting	NT	YES	Hg & HPAHs > ERL; SET bivalve larvae EC_{50} & LC_{50} > 100%
CDF	243-245	2006	85,000	14 ft bgs	91	5	4	NT	NT	YES for Side-Casting	NT	YES	Cu > ERL; SET bivalve larvae EC_{50} & LC_{50} > 100%
CDF	258 Fill	2006	20,000	-16 and -20	72	17	11	NT	NT	YES for Side-Casting	NT	YES	Cu, Hg, DDE & tDDT > ERL; SET bivalve larvae EC_{50} & LC_{50} > 100%
Dry Dock	258LDD Top	2006	50,000	Sediment Horizon	48	28	25	NT	NT	YES for Side-Casting	NT	YES	As, Cd, Cr, Pb, Ni, DDE, tDDT, tPCBs & HPAHs > ERL; Cu & Hg > ERM; %; SET bivalve larvae EC_{50} = 71.1% & LC_{50} =65.7% (LPC not exceeded)
Dry Dock	258 LDD Bot	2006		-39	96	2	2	NT	NT	YES for Side-Casting	NT	YES	No ERL/ERM exceedances; SET bivalve larvae EC_{50} & LC_{50} > 100%
Dry Dock	258 Side	2006		-24	89	6	5	NT	NT	YES for Side-Casting	NT	YES	Cu, Hg, DDE & tDDT; SET bivalve larvae EC_{50} & LC_{50} > 100%

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Type of Sample	Composite Sample ID	Year Sampled	Current Dredge Volume* (CY)	Max. Sampling Elevation (feet MLLW)	Material Properties			Environmental Suitability					Comments
					Composite Grain Size			Open Water			Fill		
					% Sand	% Silt	% Clay	LA2	LA3	In Harbor	CDF	Upland	
Consolidated Slip Remediation													
Dredge	A Top	2006	549,000	-23	28.8	38.9	32.2	NT	NT	NT	YES	YES With Restrictions**	As, Cd, Ni, dieldrin & 4 PAHs > ERL; Cr, Cu, Pb, Hg, Ag, Zn, DDE, tDDT, chlordanes, 8 PAHs, HPAHs, LPAHs & tPAHs > ERM; Dis. Pb > STLC; EET TBT > chronic criterion; EET bivalve larvae EC_{50} = 29.0% & LC_{50} =27.6% (LPC not exceeded)
Below Dredge	A Bot	2006		-27	40.7	31.8	27.4	NT	NT	NT	YES	YES With Restrictions**	As, Cd & 5 PAHs> ERL; Cr, Cu, Pb, Hg, Ni, Ag, Zn, DDE, tDDT, chlordanes, 7 PAHs, HPAHs, LPAHs & tPAHs > ERM; Dis. Pb > STLC; EET TBT > chronic criterion; EET bivalve larvae EC_{50} = 65.6% & LC_{50} =20.2% (LPC not exceeded)
Dredge	B Top	2006		-23	32.4	40.7	26.9	NT	NT	NT	YES	YES With Restrictions**	As, Cd, Cu, Pb, Hg, Ni, Zn, tPCBs, 8 PAHs & tPAHs > ERL; DDD, DDE, tDDT, chlordanes, 5 PAHs, HPAHs & LPAHs > ERM; Dis. Pb > STLC; EET TBT > chronic criterion; EET bivalve larvae EC_{50} = 56.4% & LC_{50} =57.2% (LPC not exceeded)
Below Dredge	B Bot	2006		-27	32.1	36.0	31.9	NT	NT	NT	YES	YES With Restrictions**	As, Cd, Cu, Hg, Ni, tPCBs, 11 PAHs & tPAHs > ERL; Pb, Zn, DDD, DDE, tDDT, chlordanes, acenaphthene, HPAHs & LPAHs > ERM; Dis. Pb > STLC; EET TBT > chronic criterion; EET bivalve larvae EC_{50} = 28.8% & LC_{50} =33.4% (LPC not exceeded)
Dredge	C Top	2006		-23	23.5	40.1	36.4	NT	NT	NT	YES	YES	As, Cd, Cr, Cu, Ni, Ag, tPCBs, 8 PAHs, LPAHs & tPAHs > ERL; Pb, Hg, Zn, DDD, DDE, tDDT, chlordanes, tPCBs, 3 PAHs & HPAHs > ERM; EET TBT > chronic criterion; EET bivalve larvae EC_{50} = 70.5 & LC_{50} =70.5% (LPC not exceeded)
Below Dredge	C Bot	2006		-27	28.9	39.1	32.0	NT	NT	NT	YES	YES With Restrictions**	As, Cd, Cr, Cu, Ni, tPCBs, 8 PAHs, HPAHs & tPAHs > ERL; Pb, Hg, Ag, Zn, DDD, DDE, tDDT, dieldrin, chlordanes, tPCBs, pyrene & LPAHs > ERM; Dis. Pb > STLC; EET TBT > chronic criterion; EET bivalve larvae EC_{50} & LC_{50} >100%
Below Dredge	D	2006		4 ft bgs	28.2	45.2	26.6	NT	NT	NT	YES	YES	As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Zn, DDE, tDDT, 9 PAHs, HPAHs, LPAHs & tPAHs > ERL; chlordanes & tPCBs > ERM; EET TBT > chronic criterion; EET bivalve larvae EC_{50} & LC_{50} >100%
Dredge	E Top	2006		Sediment Horizon	30.2	45.6	24.1	NT	NT	NT	YES	YES	Cu, Pb, Hg, Ag, DDE, tDDT, dieldrin, tPCBs, 13 PAHs, HPAHs & tPAHs > ERL; chlordane & LPAHs > ERM; EET TBT > chronic criterion; EET bivalve larvae EC_{50} = 29.3 & LC_{50} =27.3% (LPC not exceeded)
Dredge	E Bot*	2006		-42.3 to -51	43.4	31.2	24.6	NT	NT	NT	YES	YES	No ERL/ERM Exceedances; elutriate analyses performed on composite of deep borings
Below Dredge	E2 Boring	2006		-53	41.9	47.2	10.8	NT	NT	NT	YES	YES	As > ERL
Dredge	F Top	2006		Sediment Horizon	27.5	37.0	35.5	NT	NT	NT	YES	YES With Restrictions**	As, Cd, Cr, Ni, Ag, dieldrin & 8 PAHs > ERL; Cu, Pb, Hg, Zn, DDE, tDDT, chlordanes, 5 PAHs, HPAHs, LPAHs & tPAHs > ERM; Dis. Pb > STLC; EET bivalve larvae EC_{50} = 30.0% & LC_{50} =30.4% (LPC not exceeded)
Dredge	F Bot*	2006		-33 to –41.2	76.2	17.1	11.3	NT	NT	NT	YES	YES	No ERL/ERM exceedances; elutriate analyses performed on composite of deep borings
Below Dredge	F1 Boring	2006		-53	92.6	5.3	2.1	NT	NT	NT	YES	YES	Ni > ERL
Below Dredge	F4 Boring	2006		-52	16.8	48.1	13.4	NT	NT	NT	YES	YES	Ni > ERL
Dredge	G Top	2006		-25	33	47	20	NT	NT	NT	YES	YES	No ERL/ERM exceedances; EET TBT > chronic criterion; EET bivalve larvae EC_{50} & LC_{50} >100%
Below Dredge	G Bot	2006		-28	47	40	13	NT	NT	NT	YES	YES	No ERL/ERM exceedances

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Type of Sample	Composite Sample ID	Year Sampled	Current Dredge Volume* (CY)	Max. Sampling Elevation (feet MLLW)	Material Properties			Environmental Suitability					Comments
					Composite Grain Size			Open Water			Fill		
					% Sand	% Silt	% Clay	LA2	LA3	In Harbor	CDF	Upland	
Below Dredge	E2, F1 F4 Borings	2006		-53	NT	NT	NT	NT	NT	NT	YES	YES	EET bivalve larvae EC_{50} & LC_{50} >100%
Cerritos Channel Widening and East Turning Basin Expansion													
Deepening/ Widening	CERR-A	2006	189,000	-57	55	33	12	YES	YES	YES	YES	YES	As, Cu, Hg & Ag > ERL; no toxicity; mostly minor but significant bioaccumulation of Cr, Pb, Ni, Se, tPCBs, LPAHs & tPAHs
	CERR-B	2006		-57	52	35	12	YES	YES	YES	YES	YES	No ERL/ERM exceedances; no toxicity; minor but significant bioaccumulation of As, Cr, Pb, Ni & Zn
Deepening/ Widening	CERR-C	2006	???	-57	32	47	22	Marginal (Amphipod Toxicity)	Marginal (Amphipod Toxicity)	Marginal (Amphipod Toxicity)	YES	YES	As, Cu, Hg, Ni & tPCBs > ERL; SET bivalve larvae EC_{50} = 78.2% & LC_{50} =100% (LPC not exceeded); significant amphipod toxicity (LPC exceeded for LA2, LA3 & P400); mostly minor but significant bioaccumulation of Cr, Pb, Ni, DDE, tDDT, 4 PAHs, LPAHs & tPAHs

APPENDIX A

CONTAMINATED SEDIMENT MANAGEMENT PLAN 2002